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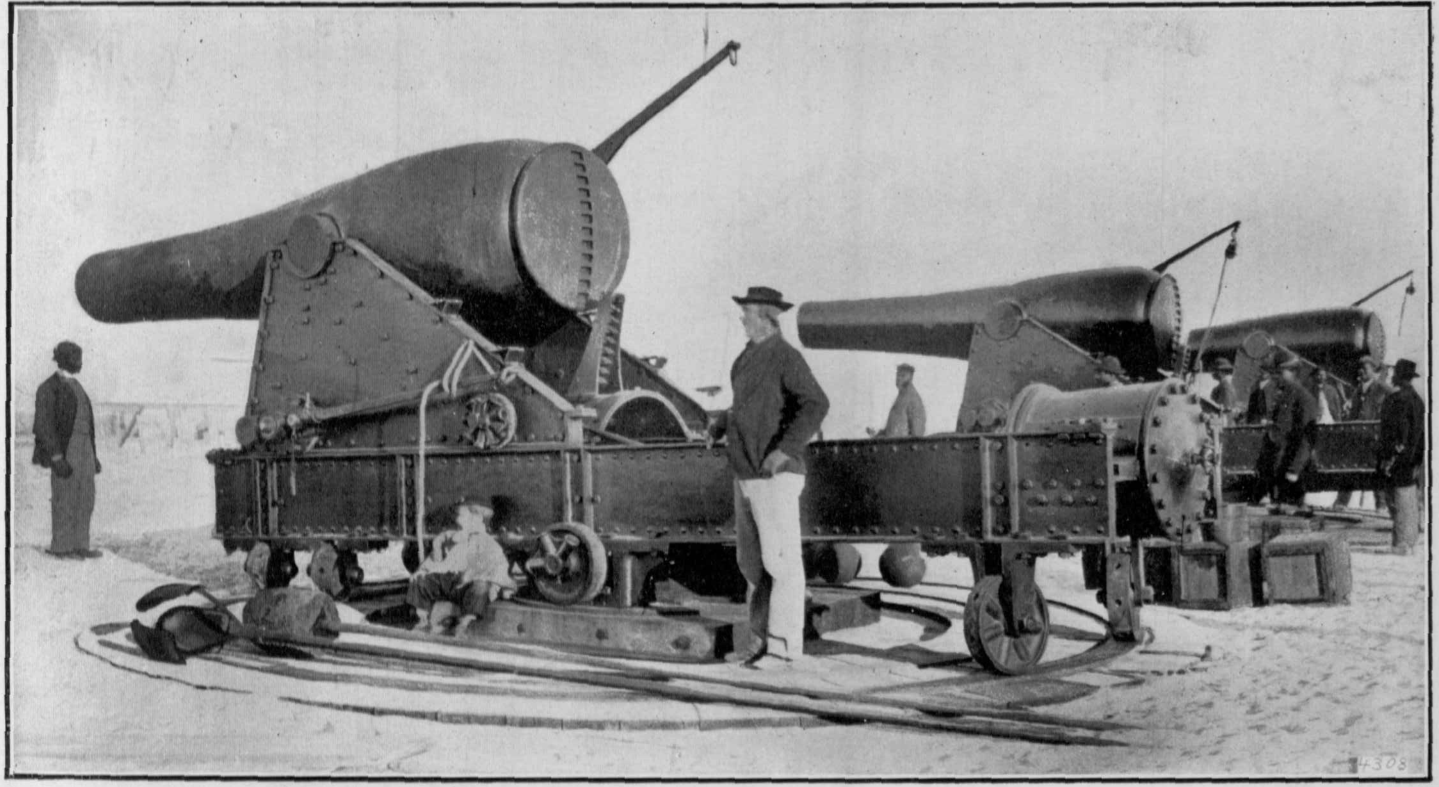

BATTERY AT FORT MONROE ABOUT 1863.

The Coast Artillery Journal

Vol. 57 No. 1 JULY, 1922 Whole No. 191

The Test by Principles

By Major General E. F. McGlachlin, Jr., U. S. A.

EVERY military plan should be susceptible to test by comparing its elements with established military principles, for example, with reference to the French War Plan of 1914, it is believed to be worth while to test it by the principles of Clausewitz.

He said, briefly, that there were three objects of war—1. To conquer and destroy the enemy's forces. 2. To seize his material and other means. 3. To gain public opinion.

The French War Plan was such that the first object might be accomplished, either,—

First, by advancing to meet the enemy's main forces in case they should attempt an advance between Switzerland and Luxemburg; or,—

Second, by overcoming inferior forces and marching upon the lines of communications of the main hostile forces in case the German main movement was through Belgium.

The plan was such that the second object might be accomplished by seizing the important material means of coal and iron in Alsace-Lorraine, controlling a great productive area, and gaining an increased population that was believed to be friendly.

The plan was best conceived to gain the support of public opinion at home and to increase the energy of action of the Russian ally.

Clausewitz's principles were four or five in number.

The first was that of superiority,—the application of all disposable industrial and military forces to the extreme limit. He said that the only way to place the result wholly out of doubt is to make the supreme effort and that if this is more than enough, no harm is done. This supreme effort creates a great moral effect in national high spirit, in-

creased confidence of friends, and fear and uncertainty on the part of the enemy. The plan was then in accordance with his first principle.

The second principle requires the concentration of all available means of action in point of time and place, in the decisive spot. These means are numbers, weapons, training, tactical dispositions, skillful application, discipline, morale, leadership, resolution. He says that the human factor is the supreme factor because material will be equally developed everywhere and, in elaboration of the principle, that to risk failure at less important points in order to increase the chances at the decisive point is what should be done. Success at the decisive point will overbalance all failure. The plan, then, was in accordance with observance of his second principle.

His third principle was that of proceeding with everything with the greatest rapidity because this makes impossible enemy measures that a less active enemy may wish to take, because it gains public approval, because it disconcerts the enemy, and because it gains friends and prevents support of the enemy. It is also a powerful element of surprise. So, the plan conformed to observance of the third principle.

His fourth principle was that of an energetic pursuit in order that profit may be made of success. But no plan can go so far.

Another principle is that a great objective must be chosen, that the theater of operations of greatest economic resources should be selected subject to any more important situation of enemy's forces, his capital and his fortresses. All other conditions are subordinate. With the observance of this principle, the plan is in accord.

In general, the plan seems to have been conceived in logical pursuance of a desire to destroy the hostile army, either by its defeat or by cutting off subsistence or by its disorganization and retreat.

I have stated that the plan accords with the *observance* of Clausewitz's principles. What I wish to convey is that the plan of concentration was so made and executed as to make possible the application of his principles. But no plan has been defined to us for putting them into effect.

As to the plan of operations actually executed after the concentration, that can be weighed against exactly these same principles and tested also by the principles of military art.

Tidewater Forts of Colonial Virginia

By Major Robert Arthur, C. A. C.

THE first coast fort built by Europeans in the Western Hemisphere was not intended primarily as a protective measure against attack from the seaward approaches nor was it built within the limits of the present United States of America, but it is of interest to us in that it marks the first attempt—unpremeditated and impotent though it was—at colonization in the New World. The early forts of America were necessarily built synchronously with the establishment of the several colonies because of the probability of attack by the natives, but, in all cases where the forts were built upon the shore line, the possibilities of invasion by European enemies required consideration and the forts were so built as to be able to withstand attack from either the landward or the seaward side. To understand the necessity for provision against aggression from overseas, one must consider for a moment the political and international aspect of the times.

In the fifteenth century, all European nations acknowledged the authority of the Pope in both spiritual and temporal matters. England was perhaps the most subservient of the nations subject to Papal control, but England was not then the leading power in world politics for she had not yet begun to send out the voyagers, discoverers and adventurers who were to establish British supremacy on the high seas and to build up the British Empire of the following century. Other countries, however, were exploring the high seas and basing claims to newly-discovered territory upon the right of discovery, but claims became valid only after confirmation by the Pope upon submission to him of proofs of the discovery. Thus it was that Spain and Portugal secured title to practically the entire uncivilized portions of the globe.

The high cost of transportation of the wealth of the Indies overland to Spain and Portugal caused these two luxury-loving countries to seek a water route to India. Spurred on by Prince Henry (the Navigator) of Portugal, the skilful mariners of that sea-going nation sought for years an eastern ocean route to India and gradually developed the shores of Africa and adjacent islands. Success was assured when Dias rounded the Cape of Good Hope in 1484 and was achieved with the voyage of Vasco da Gama in 1498.

In the meantime, Spain had undertaken exploration with a view to discovering a western route to the Indies and had sent Columbus out as a pathfinder. That doughty mariner and cosmographer had pur-

sued his idea of a western route with the indomitable persistence of a single-track mind and, after eighteen years, had received his reward in the outfitting of the expedition of 1492. His tiny fleet reached land in October of that year and he felt that he had succeeded in his mission. Pursuing his explorations among the West Indies, he was deserted by the *Pinta* and was later further handicapped by the wrecking of his flagship, the *Santa Maria*. After crowding his crew upon the smaller *Nina*, he was relieved to find that some of the men desired to remain in Hayti. Seizing upon the opportunity to effect the Christian colonization of a heathen country, Columbus landed his men and built a fort at La Navidad, on the northern shore of the island. Provisioning the fort for a year and equipping its occupants with a small boat and with some seed for planting, he left a garrison of forty men and set sail for Spain in January of 1493. Returning in November of that same year, he found that the fort and the neighboring Indian village had been attacked and burned by the mountain Carib tribes. The first colony in America had been destroyed.

Following this first voyage, Spain submitted to the Pope the usual proofs of discovery and the Papal Bull of 1493 was issued. In it Spain was granted title to all undiscovered or newly-discovered land west of a more or less vague north-south line established in the Atlantic Ocean. This land was later made more definite and, as finally established, was passed through the then undiscovered eastern projection of South America. By virtue of Portugese discoveries, Portugal could lay claim to all land east of this line not occupied by Christian nations, and nothing was left for the other countries which had not yet begun their voyages of exploration.

Somewhat later, England began searching for the northwest passage to India, and, that failing, laid claim to and colonized the northern portions of the new continent. Spanish activities had been confined to the more temperate climates, and England, while recognizing and respecting Spanish rights in territory occupied by Spanish colonists or adventurers, did not acknowledge Spanish rights, based on the allocation of the Pope, to unoccupied lands. When, still later, France entered the field and claimed the Arctic regions, and when the Dutch and Scandinavians made their settlements, all the elements essential to cause armed conflict were present, the colonists being literally between the devil and the deep sea. The prevalence of war in France in the seventeenth and eighteenth centuries and the innumerable pirates and privateers who infested the high seas during this period only served to increase the precariousness of the foothold established by the colonists in the New World.

The first effective colony sent out from England was that which entered Chesapeake Bay in May of 1607. The territory which surrounded the bay was within the zone to which the Spanish laid active

claim, and the colonists had been instructed to establish themselves at least fifty miles from the seacoast so as to reduce the probability of attack by the Spaniards. Nevertheless, they began their search for a suitable site at the entrance to the Bay and gradually explored the shores of the bay and the banks of the James River until they reached a point of land on the north bank which they considered satisfactory for their new home. This they called Jamestown in honor of their king. Subsequent events proved the unsuitability of their choice, but the determining factor in their location at Jamestown seems not to have been the fertility of the soil, the healthfulness of the site nor the defensive features of the place, but the fact that "our shippes doe lie so neere the shoare that they are moored to the Trees in six fathoms water."

The landing was effected on May 24, 1607, and, considering the probability of attack by the Spaniards, if not by the Indians, it might have been expected that the colonists would at once erect some form of fortification. The President, Captain Edward-Maria Wingfield, seems, however, to have trusted too much in the friendly attitude of the Indians or was, perhaps, too jealous of his authority to undertake at first any defensive construction. Captain John Smith says: "The Presidents overweening iealousie would admit no exercise at armes, or fortification, but the boughs of trees cast together in the form of a halfe moone by the extraordinary paines and deligence of Captaine Kendall." An attack by the Indians early in June was sufficient to cause Wingfield to proceed energetically with the construction of a fort which was completed by the latter part of the month.

This first fort was triangular in shape, with a base four hundred twenty feet long resting on the river and with sides each three hundred feet long extending back from the shore. At each of the three corners was constructed a tower or "Bulwarke" in which the culverins and the demi-culverins of the colony were mounted in such a manner as to cover both the landward and the seaward approaches. Robert Tindall seems to have been appointed the first gunner of the fort. Early in January of 1608, some member of the colony "accidentally fired their quarters, and so the towne, which being but thatched with reeds, the fire was so fierce as it burnt their Palisado's, (though eight or ten yards distant) with their Armes, bedding, apparell, and much priuate prouision."

From this time up to the end of the colonial period we find the colonists of Virginia constantly engaged in the construction of defensive works. During the first hundred years of the life of the Colony, the inhabitants suffered from many serious handicaps. The death rate, particularly during the first half of the century, was appallingly high, and the attention of the colonists was necessarily concentrated upon their immediate self-preservation from Indians, starvation and disease. Nevertheless, we find them, poverty-stricken and depleted by disease

as they were, building, rebuilding and repairing fortifications from the time the Colony was first founded until it was merged with the other colonies and the building of coast defenses was taken over by the central government.

The climate of Virginia seems to have been conducive to rapid decay, and this, combined with a lack of engineering skill among the men of the Colony, prevented the erection of enduring works. As a result, the forts quickly fell into delapidation and ruin. The London authorities were continually exercised over the defenceless condition of the Colony and frequently urged the construction or reconstruction of defensive works, but the burden of taxation lay so heavily upon the colonists that they were unable to maintain satisfactorily the desired forts. Combined with this was a growing sense of security induced by their continued immunity from attack, and there became evident an ever-increasing tendency to permit the fortifications to fall into complete ruin and decay.

"The spring approaching, and the ship departing, Mr. *Scrivener* and Captaine *Smith* divided betwixt them the rebuilding *Iames* towne; the repairing of our Pallizadoes; the cutting downe trees; preparing our fields; planting our corne, and to rebuild our Church, and recover our Store house." The design of the reconstructed fort seems, however, not to have satisfied Captain Smith for, when he became President later in the year, he had the "Fort reduced to a fiue-square forme." He also tells us that he had "the order of the watch renewed; the squadrons (each setting of the Watch) trained; the whole Company euery Saturday exercised, in the plaine by the west Bulwarke, prepared for that purpose, we called Smithfield" (after Sir Thomas Smith). In his efforts toward preparedness, Captain Smith also began the construction of a second fort "neere a conuenient River vpon a high commanding hill, very hard to be assaulted and easie to be defended" to which the colonists might retreat in case of necessity, but, because of scarcity of provisions with winter approaching, the work was not completed. Other outlying blockhouses were, however, added later.

In 1609, a second fortification, designed solely for protection from attack from the seaward, was raised at Point Comfort. This point at the mouth of the James River had received its name on May 8, 1607, when a party of the colonists, after exploring the southern side of Chesapeake Bay and finding only shoal water, "rowed over to a point of Land, where we found a channell, and sounded six, eight, ten or twelve fathom: which puts us in good comfort. Therefore wee named that point of Land, Cape Comfort."

The strategical value of Point Comfort was recognized from the first, for, notwithstanding the great width of the James River at this point, the channel was so narrow that vessels were compelled to approach very close to the shore, and the colonists believed that defences erected

here could prevent the passage of hostile ships up the river. So soon, then, as the Colony began to expand beyond the confines of James Fort, the construction of works at Point Comfort was considered a necessity and was ordered.

Just before Captain John Smith left the Colony in early October of 1609, Captain James Davis arrived from England with sixteen men in a small pinnace, the *Virginia*, which had been built in New England. To this detachment was added a detail from Jamestown, and the whole, under Captain John Ratcliffe, was sent to Point Comfort to build the new fort. This fort was named "Algernoune Fort" by President Percy in honor of William de Percy, first Lord Algernon, but the use of the name does not seem to have survived Percy's departure for England in 1612.

At first Fort Algernon consisted of but a simple earthwork, but by 1611 it was well stockaded and contained seven heavy guns and a number of smaller weapons, the whole being manned by a detachment of forty men under Captain James Davis.

Sir Thomas Gates arrived at Point Comfort on May 31, 1610, and found the colonists reduced to a condition of utter misery and starvation. Jamestown appeared "rather as a ruin of some ancient fortification than that any person living might now inhabit; the palisadoes tourn down, the portes open, the gates from the hinges, the church ruined and unfrequented, empty houses whose owners untimely death had newly taken from them, rent up and burnt, the living not able as they pretended to step into woods to gather other firewood, and it is true the Indians as fast killing without as the famine and pestilence within." Having encountered many hardships on this trip, Gates was himself without provisions for the colonists, so, after consultation with the Council, he decided to abandon the Colony, and on the eleventh of June he sent the *Virginia* to Point Comfort to take off Captain Davis and his men while preparations were being made at Jamestown for embarkation.

Some touch of sentiment caused Gates to oppose all suggestions for the destruction of the settlement and, after burying the ordnance at the gate of the fort, he embarked with all his company on the seventeenth of June, leaving the stockades and buildings standing. Descending the river as far as Mulberry Point, he was met by the *Virginia* carrying Captain Edward Brewster with word of the arrival of the new governor, Lord de la Warr, who had landed at Point Comfort on the sixteenth and who had with him an ample supply of provisions. Complying with the instructions of De la Warr, Gates, "to the great grief of all his company (only except Captain John Martin), as wind and weather gave leave, returned his whole company with charge to take possession againe of those poore ruinated habitations at Jamestown, which he had formerly abandoned."

Shortly after his arrival, Lord de la Warr had the fort at Jamestown newly palisaded with strong plank and posts "set four feet deep in the ground." He also ordered the construction below Kecoughtan (Hampton) on opposite banks at the mouth of the Southampton River of two forts which were named Forts Henry and Charles "in honour of our most noble Prince and his hopeful brother" and in which "all those that come out of *England*, shall be at their first landing quartered, that the wearisomnesse of the Sea, may bee refreshed in this pleasing part of the Countrie." The location was so delightful and the natural resources of the vicinity were so great ("they stand in a wholesome aire, hauing plentie of Springs of sweet water, they command a great circuit of ground containing Wood, Pasture and Marsh, with apt places for Vines, Corne and Gardens") that the garrisons received but one-half of the usual allowances from the public stores. Captains Yeardley and Holcroft were given command of the two forts.

Somewhat later De la Warr directed that another fort be erected at the falls of the James River, but it was soon abandoned and was probably never finished. The garrisons of Forts Charles and Henry and the fort at the falls were called to Jamestown to participate in the expedition of November in search of gold and silver. The expedition was unsuccessful and returned to Jamestown, but the forts were not then regarrisoned. The death rate among the colonists had been so high that the Governor felt compelled to concentrate them at Point Comfort and Jamestown only.

Lord de la Warr having returned to England because of illness, Sir Thomas Dale arrived at Point Comfort on May 22, 1611, and assumed control of the affairs of the Colony. He immediately inspected Forts Henry and Charles and ordered their repair and reoccupation, Captain John Davis being appointed "taskmaster" for the three forts, Algernon, Henry and Charles. Dale also "newly impaled" Jamestown and built the town of Henrico, so-named in honor of Prince Henry, some distance above Jamestown. Henrico, about four acres in extent, was surrounded by a stout stockade, and at each of the four corners was erected a watch-tower in which the ordnance was mounted and sentinels stationed.

In the latter part of June of 1611, a Spanish vessel anchored off Point Comfort, and Don Diego de Morlina, Don Antonio Perez and Francis Lymbrye landed to demand a pilot to take them up the river. Captain Davis imprisoned them and sent John Clark aboard the vessel to make an attempt to bring it closer to the fort. The sailing master, becoming suspicious, made Clark a prisoner and began a parley with the English forces. Finally the Spaniard told Davis that unless the prisoners were released he would open fire upon the fort, whereupon Davis told him to "go to the Devil," and the sailing master withdrew taking Clark with him to Havana.

Late in August of 1611, Dale wrote to the prime minister asking for a "standing army" of two thousand men to enable him to fortify more strongly; first, Point Comfort: second, Kiskaick; third, Jamestown; fourth, Henrico; and fifth, at the Falls. It does not appear, however, that his request received approval.

In February or March of 1612, Fort Algernon was burned to the ground. At this time it consisted of a stockaded earthwork containing a storehouse, a magazine, and the quarters of the garrison. The armament consisted of two pieces of 35 quintales, five of 30, 20 and 18 quintales, and a number of smaller weapons, manned by a garrison of forty men. We are told that Captain Davis and his men set at once to work rebuilding the fort, and in May we find some of Captain Argall's men engaged in "fortifying at the point."

About this time Captain George Webb was given command of Forts Henry and Charles, but a short time later the three forts at the mouth of the James River were dismantled and placed in the hands of caretaker detachments. In 1614, Captain Webb was in command of the forces at Kecoughtan; Captain Smalley was commanding at Henrico in the absence of Captain James Davis; and Lieut. Sharpe commanded at Jamestown in the absence of Captain Thomas West.

Captain Argall was appointed Governor in 1617 and arrived in May of that year. He found the fortifications of the Colony, particularly at Jamestown, in a poor state of repair, and, while he effected some improvement, Governor Yeardley, returning in 1619, found "practically no fortifications capable of resisting a foreign enemy."

In 1621 the London Company, in anticipation of attack by some of the constantly passing Spanish vessels, directed Governor Wyatt to erect fortifications on the larger rivers, and in 1622 sent out Captain Samuel Each, of the *Abigail*, to erect a fort in James River above Blunt Point.* Captain Each proposed to build a fort or blockhouse upon the immense oyster banks (Tindall's Shoals) near this point in order to command the passage. The proposition was considered for a time but it was found to be unfeazible for, as Sir Miles Sandys reported on April 9, 1623, the oyster bank was a "false loose ground."

Captain Roger Smith reported that a fort upon the shore would command the channel as well as one in the stream, so he was detailed to supervise the construction of such a work. One man from every twenty in the colony was drafted for this labor, but, as had so often been the case before, sickness and lack of provisions and supplies caused suspension of the work and apparently the fort was never completed.

*Probably named after Humphrey Blunt. On July 16, 1610, "as Sir Thomas Gates was going down the river, he saw the longboat belonging to Algernoune Fort (Point Comfort) blown ashore near to Weroscoich, and sent Humphrey Blunt after it, whom certain Indians (watching the occasion) captured and killed before the eyes of Lieutenant-General Gates, who in revenge, upon July 19, early in the morning set upon a town of theirs some four miles from Algernoune Fort, called Kecoughtan, and captured it."

That portion of the plan which contemplated the erection on Tindall's Shoals of a platform large enough to accomodate five or six pieces of ordnance to support the mainland fort does not seem to have been undertaken.

Captain Nathaniel Butler spent some eight months in Virginia in 1622-1623, and upon his return to England he made a caustic and somewhat unjust report which he called "The Unmasked Face of our Colony in Virginia, as it was in the Winter 1622," and in which he stated "That he found not the least Piece of Fortification: That three Pieces of Ordinance only were mounted at *James City*, and one at *Flower-de-Hundred*, but not one of them serviceable." The Governor and the Council, in their general denial of his charges, admitted that "We have, as yet, no Fortifications against a foreign enemy," and pleaded poverty and lack of provisions as their excuse. They went on to say, *re* Butler: "His envy would not let him number truly the Ordnance at *James* City: four Demi-Culverins being there mounted, and all serviceable. At *Flower de Hundred* he makes but one of six; neither was he ever there, but, according to his Custom, reporteth the unseen as seen. The same envy would not let him see the three pieces at *Newports-News*, and those two at *Elizabeth City*. Two great Pieces there are at *Charles Hundred*, and seven at *Henrico*. Besides which, several private Planters have since furnished themselves with ordinance."

It was quite customary, in the early days of the Colony, to mount cannon at the several plantations, and in most cases these were privately owned. While the guns were mounted, for the most part, with a view to the protection of shipping in case of attack, they appear in the nature of shore batteries rather than as the ordnance of a fort. Many such batteries appear, endure for a while, and then disappear. Their carriages were of wood, and the climate so quickly rotted all wooden construction and pitted all cannon that we hear more of honey-combed guns lying half-buried in the sand than we do of serviceable batteries.

In August of 1623, the Company instructed the Governor to "Proceed with the fort" but the Governor and the Council were forced to report in February of 1624 that, because of the general sickness of the colonists, they had been obliged to discontinue the work. At about this time a number of Commissioners were sent to Virginia to inquire into conditions in the Colony. One of the questions put to the Governor and the Council was: "What places in the country are best or most proper to bee fortefied or mainteyned against Indians, or other enimies that may come by Sea?" To this the Council replied that "Point Comfort is of most use but of great charge and difficultie. Wariscoyake where the fortification was intended more effectual to secure the places above it. From Wyanoke marish upwardes there are divers places which may peremptorily command Shippinge or Boates."

Captain John Harvey, a member of the Commission, reported, when

he left the Colony in 1625, that "of all *the publique stock* which within the past six yeares hath been disbursed there remains no publique work, as guest house, bridge, store-house, munition-house, publique granary fortification, church, or the like." That same year the London Company reported to the Board of Trade and Plantations: "As for fortificacon agaynst a forraigne enemy there was none at all, onely foure pieces mounted, but altogether unserviceable." These criticisms were probably entirely accurate, but nothing further in the matter of fortification seems to have been done until about 1629. Governor Wyatt, in 1626, asked assistance in the construction of defences at the mouths of the James and the York Rivers, and in 1629 the Council declared the Colony too poor to undertake unaided the erection of forts. William Pierce stated shortly afterwards that there was "no manner of fortifications" in the Colony.

Assistance from England not being forthcoming, the General Assembly, believing that a permanent fort at Point Comfort was vital to the safety of the Colony, adopted measures in 1630 for the erection of an elaborate work. This new fort was to be more solidly constructed and more permanent in character than any of the preceding works, and the preliminary arrangements were very carefully made. A committee from the General Assembly inspected the proposed site, drew up the plans, and turned the work over to Captain Samuel Matthews, who proceeded with expedition and reported, in February of 1632, that the fort was completed. For its preservation and maintenance all incoming ships were taxed in powder and all immigrants were taxed sixty-four pounds of tobacco to be paid from their first crop.

Francis Pott was placed in command of the fort at Point Comfort but was shortly afterwards charged by Governor Harvey with misbehaviour and was replaced by Francis Hook. Hook died there in 1636, but during his administration he managed the affairs of the fort so badly that, at his death, "there was not soe much powder left in the Fort as would Lode one piece of Ordinance to discharge att his Funerall. But there was due by his Booke fifty pounds of powder to the Fort being Lent by the sayd Capt. Hooke the Summer before to one Lieftenant Upton in case of Distresse and Danger Doubted from the Neighbouring Indians to the Inhabitants of the Isle of Wight Country where the sayd Upton is the p^{r}sent commander."

"Upon the death of the sayd Capt. Hooke one Capt. Christopher Wormeley was appointed by the Governor to attend service of the Fort * * * who coming to the command after the arrival of most of the shipps of that year received little powder, the masters p^{r}tending they had payed at their going out, and what was payed was soe bad that it onley served to give every ship a salute at her departure according to the custom of the place."

The pay of the garrison at this time, according to the schedule of 1633, was:—

	Lbs. Tobacco	Bbls. Corn
Captain	2,000	10
Gunner	1,000	6
Drummer	1,000	6
4 men, each	500	4

From the very first the affairs of the fort seem to have been badly managed, and the tax for upkeep must have been misapplied or largely wasted, for when Captain Richard Morrison arrived in March of 1638 to relieve Wormley, there were practically no stores on hand and the fort was in decay. In fact, the General Assembly found it necessary to levy, in 1640, a poll tax of two pounds of tobacco on the inhabitants of the Colony in order to effect repairs which practically amounted to a complete reconstruction of the fort. Captain Morrison obtained leave of absence with permission to visit England and was relieved in 1641 by his brother, Robert Morrison.

In 1645, following the massacre of 1644, Fort Charles, named after the Prince Royal, afterwards Charles the Second, was erected at the Falls of the James River. This fort ultimately decayed and was rebuilt in 1676.

In 1650 Governor Berkeley received authority to build forts of "lime and stone and other materials" but he seems not to have availed himself for some time of this authorization. In 1652 a Major Fox appears to have been in command at Point Comfort. In 1662 Colonel Francis Morrison, another brother of Richard Morrison, was appointed to the command of this fort which had again fallen into disrepair and become unserviceable.

About this time the traders and ship owners attempted to have the fort duties abolished on the ground that the fort was useless and served no purpose of protection. Their plea was unavailing but the accuracy of their charges was tacitly admitted upon the outbreak of war between England and Holland in 1665, when Colonel Miles Cary, then in command at Point Comfort, was directed to remove the garrison and all ordnance to Jamestown.

Following the outbreak of war, the king ordered the construction, on the several rivers, of forts which should serve as a protection to the shipping in case of attack, but the Colony did not take the instructions seriously and erected nothing more important than a few breastworks, except at Jamestown where a somewhat more pretentious work was put up by Captain William Bassett. The garrison for this fort was to consist of the guard of one officer and twenty men which had been established by the General Assembly in 1663 to attend the Governor and the Council at the meetings of the General Court.

From the time of the founding of the Colony until the advent of Governor Berkeley the value of Point Comfort as a site for defensive works was fully recognized, and some kind of a fort had been maintained at that place almost continuously from 1609. A change of sentiment appears during Berkeley's regime and no effort was made to keep the fort serviceable. The English authorities therefore found it necessary to direct the Governor to restore the fort at Point Comfort, and the work was undertaken with his very reluctant approval. An entirely new fort seems to have been planned but considerable difficulty was encountered in constructing a fort on the subsoil of loose sand, expenses mounted beyond the estimates, and the work progressed slowly. Finally all construction stopped, and the Council requested the Governor to petition the king for authority to discontinue the project.

The Assembly felt that the Colony had expanded to such an extent that a fort at Point Comfort would afford no protection to the greater portion of the Colony. Such a fort would, of course, protect the plantations and towns located on the James River, but there was a very manifest desire on the part of the Governor to locate the James River fort at Jamestown,—very possibly because he, as the senior officer present, would receive the fort duties. A complaisant committee from the Assembly reported against the fortification of Point Comfort on the grounds that the channel was of greater width than had been generally supposed, that the cost would be excessive, that the population of the vicinity was unduly sparse, that there was a lack of fresh water, and that the surrounding soil was not sufficiently fertile to help support the garrison.

As a counter project, the Committee proposed the erection of five forts; one at Yeocomico on the Potomac River, one at Chorotoman on the Rappahannock River, one at Tindall's Point on the York River, one at Jamestown on the James River, and one at some suitable point on the Nansemond River. Although the erection of a fort at Jamestown, with none at Point Comfort, would expose to attack both shores of the lower James, the recommendations of the committee were approved by the House of Burgesses in spite of considerable opposition, and by the end of 1667 the forts were fairly under way.

In June of 1667, Colonel Leonard Yeo was authorized to impress men and material for mounting eight guns at Point Comfort and Gowing Dunbar was appointed Chief Gunner, but "on the 27th of August followed the most dreadful hurricane that ever this country groaned under, it lasted 24 hours began at the North East and went around northerly till it came South East where it ceased it was accompanied with a most violent rain but no thunder the night of it was the most Dismall tyme that ever I know or heard of, for the wind and rain raised so confused a noise mixt with the continual cracks of falling houses and the murmer of the waves impetuously beaten against the shores and by that violence

forced and as it were crowded up into all Creekes Rivers and Bays to that prodigious height that it hazarded the drowning of many people who lived not in sight of the Rivers yet were forced to climb to the top of their houses to keep themselves above water carryed all the foundations of the fort at Point Comfort into the river and most of our Timber which was very chargeably brought thither to perfect it, had it been finished and a garrison in it they had been stormed by such an enemy as no power but God's can restrain and in all likelyhood drowned."

The urge to build forts in such comparative profusion resulted very probably from an invasion of the Bay by the Dutch earlier in the year at a time when there was no such protection. Several ships laden with tobacco were surprised on the James River and either captured or burned. The new forts were designed to afford safe anchorage in the several rivers. The walls were to be ten feet high and at least ten feet thick on the water front, while the interiors were to contain eight pieces of ordnance. The peace-time garrison of each was to consist of one gunner and four men.

The colonists found the same difficulty in the maintenance of these new forts that they had encountered in their earlier projects, and we find the works falling at once into decay. Three years after their completion they were all practically in ruins, and in 1672 the Assembly ordered that all repairs to forts should be of brick unless of a minor character. The fort at Jamestown was rebuilt as a large brick wall in the shape of a half moon, but it appears to have been poorly located on low ground above the old fort. At this point the channel ran close to the shore but the high bank of the river below the fort so limited the field of fire "that if a ship gave a good broadside just when she came to bear on the fort, she might put the fort into that confusion as to have free passage at once enough."

The merchants trading with Virginia continued to be opposed to the abandonment of Point Comfort, and their opposition was intensified in 1673 when a Dutch man-of-war destroyed a number of vessels lying in the James River. As usual, however, their protests were unheeded, and the Governor and the Council contented themselves by reiterating their objections to the Point Comfort site.

The inhabitants of Isle of Wight and Lower Norfolk counties were fully aware of the extent to which their lack of fortifications exposed them, so in 1673 they obtained from the General Assembly authority to erect a fort on Warrosquoick Bay and another on Elizabeth River, but they were evidently not satisfied with their own defensive measures for, in 1676, they petitioned the Governor that a fort "be erected att *point Comfort* as being the most conuenient place (as wee humbly conceaue)." However, the Governor's opposition to the establishment of fortifications at Point Comfort continued.

The growing disinclination of the colonists to the maintenance of fortifications seems to have reached its climax at about this time. For

the remainder of the century we see practically no more activity in the construction of defensive works. The forts then existing were allowed to fall gradually into decay, and one by one they were abandoned. In 1681, shortly after his arrival in the Colony, Lord Culpepper inspected all the forts and declared that none could withstand an attack, either by sea or by land. In 1685, Fort James on the York River and Jamestown still had some serviceable guns, but the other forts had almost entirely fallen to pieces, with their guns lying, in some cases, buried in the sand. Governor Nicholson declared in 1690 that it "was a very improper use of terms to describe them as fortifications at all."

By 1691 the fort at Jamestown had become so delapidated that it could no longer be used as a shelter for the stores pertaining to it. In 1693, however, Sir Edmond Andross, who had become Governor, partially restored the defences at Jamestown and, later, those at Tindall's Point. In 1695, Colonel William Byrd and Colonel Edward Hill, reporting on the fort at Jamestown, stated that it was in the final stages of decay and that it could not possibly be repaired, whereupon the Council recommended that it be demolished. The razing of this fort left only the fort at Nansemond and the one at Tinsdall's point in commission. These forts also were in very poor condition, and in 1699 the Governor and the Council recommended that all forts be allowed to sink into complete ruin. Thus we find the Colony of Virginia at the close of the century with no pretence at protection against invasion by a foreign enemy.

The general outbreak of war in Europe in the opening days of the eighteenth century again turned the attention of the Governor toward defensive works but failed to excite any interest among the colonists. They had been immune from attack during similar preceding wars and they saw no reason to believe that they would not continue to be immune. Nevertheless, Governor Spottswood reported to the Commissioners of Trade that he was "of the opinion that a small fort built upon Point Comfort would be of good use." Rumors of the approach of a French fleet made it highly undesirable to delay further the restoration of the defensive powers of the Colony, so the Governor, without waiting to call together the General Assembly, contracted numerous debts by erecting fortifications. He managed to put up several forts and to make other improvements in the defensive situation of the Colony. By the latter part of 1711 he had about seventy cannon mounted in works at Old Point Comfort, Tindall's Point, Yorktown, and Jamestown.

In 1712 Governor Gooch called the Assembly together and, in his opening message, called attention to the unprotected state of the coast and the frontier, and advised the repair of forts and the appointment of annual salaries for the officers and the gunners, and he recommended that the fort at Old Point Comfort be kept in a constant state of readiness during the war. Forts had so long been objects of aversion to the peo-

ple of the Colony, however, that they were extremely frugal with the public money whenever appropriations for the defensive works were discussed, and consequently not a great deal was accomplished.

At the meeting of the Assembly in 1728 the question of repairing the works at Old Point Comfort was recommended for the special consideration of the Assembly. A committee of the House of Burgesses was appointed to "inquire into the present condition of the Battery at Point Comfort, and the fittest place for erecting a battery there." The committee reported early in March that it had found twenty large iron cannon, some of them badly honey-combed, and that it had located a suitable site for a battery; and it recommended that twelve of the best guns be mounted therein as sufficient for the safety of the Colony. The House, upon receipt of this report, expressed itself as favoring the erection of new works.

About 1736-38 the fort was again rebuilt and placed under the command of Captain Samuel Barron, who had possibly seen military service. This is probably the original Fort George, although the name is sometimes applied to the batteries and works which preceded it earlier in the century.

Fort George was substantially built of brick and shell lime in two lines of walls about sixteen feet apart. The bricks, home-made, were nine inches long by four inches wide by three inches thick. The exterior wall was twenty-seven inches thick and the interior was but sixteen inches thick, the two being connected by counterports ten or twelve feet apart, forming a system of cribs which were probably filled with sand.

When the General Assembly met in 1742, war with Spain was still going on, but no interest was evident in Virginia. Fort George had been built in preparation for the war but, since its erection, had received but little care. Governor Gooch, in a message to the Assembly, suggested that money be voted for the repair of the batteries at Yorktown and Gloucester Point and for keeping the batteries and Fort George in a constant state of defense, to which the Assembly replied that these desirable objects ought by all means to be attended to, but that the expense should be defrayed from the duties appropriated by Act of Assembly for that purpose.

It was during this session of the Assembly that Colonel William Beverly presented his claim to the lands at Point Comfort,—a claim that his father, Robert Beverly, had presented at an earlier date. There was a long contest over the title to these lands, Colonel Beverly claiming that they had been granted to Robert Beverly by patent in 1706. As early as 1628 we find that "Elizabeth Jones, wife of Giles Jones, gent.," was granted one hundred acres by Francis West "as her own personal dividend, being an ancient planter, said land being in the 'Island of Point Comfort,' abuting easterly upon the bay of 'Chesapeiache' and

westerly upon the creek which divides said island from the main land." This seems to cover the identical land to which Colonel Beverly laid claim, but it is possible that the original title had been escheated by 1706. At any rate, the Beverly claim was referred to the Attorney General for investigation and report. Evidently the report indicated that Beverly had a legal title to the land for, in 1744, "the said William Beverly for and in Consideration of the Sum of One hundred and five Pounds Current Money to him in hand paid at or before Ensealing and Delivery of these Presents the Receipt whereof he doth hereby acknowledge Hath Granted bargained sold aliened released Enfoeffed and confirmed unto the said William Gooch his Heirs and Assigns for ever All that Neck or Point of Land Sand and Marsh on the South West End of Point Comfort containing about one hundred and twenty acres * * ."

In his address to the session of the Assembly which met in 1744, Governor Gooch again recommended the repair of the batteries at Yorktown and at Gloucester, and asked for an appropriation providing for a garrison at Fort George. The assembly finally voted to repair Fort George.

In 1745, because of the relations existing between England and France, the Colony was advised to put itself in readiness against the threatened danger, and the Assembly was accordingly convened by Governor Gooch. The Assembly, however, adjourned without taking any special action, for it was discovered, in the course of the debate on a bill for the repair and maintenance of the forts, that nothing adequate to the supposed contingencies could be accomplished because of the determined economy of the Assembly. The advocates of preparedness asked for too much and the bill, after a long and warm debate, was decisively defeated.

We are told that a hurricane totally destroyed Fort George in 1749. At any rate Governor Dinwiddie reported to the Lords Commissioners for Trade and Plantations, early in 1756, that "we have no Forts in y's Dom'n. There was one erected at the mouth of Jas. River, but as it was built on a Sandy Foundat'n, the Sea and Weather destroy'd it, [so] y't the Guns lie dismounted, and of no Use. There are two small Batteries on York River, [which] are only of Service to protect the Merch't Ships in y't River, and of no Defence ag'st an Enemy y't have Force sufficient to attack them [by] Land, or a Ship [with] Force to run up the River, may demolish them both."

A year later he made a somewhat more detailed report in which he said: "I beg Leave to inform Y'r L'd'ps y't there are three Forts in y's Dom'n, one called F't George, at the Mouth of James River, where I went to view it. It was built on a Sandy Bank; no care to drive Piles to make a Foundat'n; the Sea and Wind beating ag'st it has quite undermin'd it and dismantled all the Guns, w'ch now lie buried in the Sand. There was mounted on y's Fort ten twenty-four-Poun-

ders, six twelve-Pounders and four nine-Pounders, all Honey-comb and fit for no Service. They were sent in here by Queen Elizabeth and King Charles. They have always been expos'd to the Weather so y't they are fit for no Service. The other two Forts are on York River, one at the Town of York, had mounted 4 Guns of 18 and 9-P'rs, 10 Small G of ½ shot, but the large Guns are all Honey-Comb and not fit for Service. The other Fort at Gloucester, on the same river, had 15 Guns of 18, 12 and 6-pounders, mounted, but like the others, not fit for Service. These three Places are very proper for Forts as they are at the Entrance of two greatest Rivers, of most Conseq'ce in y's Colony. The Batteries are in most ruinous Condit'n, tho' considerable Sums have been laid out upon them, yet for want of a skillful Ingineer to direct the Construct'n, particularly in making a good Foundat'n, the Tides and Weather have undermined the walls." He also recommended the location of a fort at Cape Henry and considered that twenty 24-pounders would be sufficient for its armament.

Apparently he failed to get his guns or his forts and before long we find the garrison at Fort George reduced to a single man. At any rate, one John Daines was charged with the care of the fort in 1774. As time hung heavily on his hands, he began exhibiting a light at night for the benefit of passing vessels, and the House of Burgesses, in June of 1775, voted him a salary of twenty pounds per annum until the Cape Henry Light, which was then being built, should be finished.

In 1775, upon the outbreak of the Revolutionary War, Governor Dunmore built fortifications at Norfolk. By 1779 several points had been fortified, the most important being Fort Nelson on the western side of the Elizabeth River, some distance below Portsmouth. Like so many other works erected only for defence against naval attack, Fort Nelson was open to the rear. This fort consisted of parallel rows of heavy logs closely dovetailed together, with the intervening space filled with hard-packed earth, making a rampart fourteen feet high and fifteen feet thick. The garrison of about 150 men under Major Thomas Matthews manned several large cannon and a few field pieces. Fort Nelson was built to protect Norfolk and Portsmouth and the navy yard at Gosport, but its inadequacy against the British armament was obvious as soon as the British fleet appeared, for the fleet, carrying about 2,000 men, consisted of the *Raisonable* of sixty-four guns, the *Otter*, the *Diligent*, the *Naarlem* Sloop, Cornwallis' galley, some private vessels of war, and the transports.

On May the tenth, the British landed below Fort Nelson at a place called the Glebe, the cannonade from the fort being ineffectual. The next day they started combined operations, whereupon Major Matthews spiked the guns and evacuated the fort.

In 1781 Sir Henry Clinton urged the establishment of a base on Chesapeake Bay, either at Old Point Comfort or at Yorktown. Prefer-

ence for Old Point Comfort being expressed, Lord Cornwallis had the site examined by a board of officers which reported unfavorably. York and Gloucester were then selected, seized and fortified, with Lieutenant Colonel Dundas in command at Gloucester and with Lord Cornwallis in command at Yorktown. Both sets of fortifications were surrendered, following the siege of Yorktown.

The situation in tidewater Virginia in 1781 is concisely expressed by Miles King, who reported to the Governor on the 27th of March that a fleet of thirty ships was in Hampton Roads, and went on to say: "Must not our situation be deplorable. Our only protection is a Guard of six men below Old Point Comfort, and a guard of twelve men at Newport News, which suffered 17 Boats full of Troops to land and make about fifty Fires, and let them go off without their discovering them. How sorry I am that we should have only such men to trust to."

The situation improved later in the year when the Count de Grasse entered the Bay with the French fleet and, after consultation with General Washington, took station with his fleet in Hampton Roads. For the purpose of covering the landing of the troops under St. Simon and for the purpose of commanding the entrance to Hampton Roads, De Grasse landed some marines and threw up some batteries among the ruins of Fort George. When the British fleet appeared off the Bay late in October, the French fleet, as if satisfied with the events at Yorktown, did not quit its station.

The Federal Government did not begin to erect coast fortifications until 1794, and until that time the ruins of the forts built by the Colony of Virginia sank further and further into oblivion. While inspecting the Virginia shores in 1793, Thomas Newton, Jr., recommended to the Governor of Virginia: "The most proper places on our river for defence, are Old Point Comfort & Point Nelson—the place where the old Point stood, nearly opposite to us & half a mile out of Portsmouth. If the ten-pounders were mounted at the first place & the twelves at the last, I think they would answer every purpose." As a postscript he gave a list of the cannon found at Norfolk and on Nelson's Point:

"These belong to Virginia: 15 four-pounders;
4 six- Do , 4-inch caliber;
1 nine- Do , 4¾-do., do.

"Some Carronades of 12 or nine-pound shot on board the cutter.

"U. S.—13 Cannon of 18 Lb. shot, 5¾ caliber;
4 do " 12- Do., 5½ do.

"One Gun of the same kind as the above, lies in Mr. Scott's mill-dam in Nansemond. It could be got up easily.

"The above belong to the United States."

All that remained of nearly two hundred years of expenditure, labor, taxation, and endeavor in providing the Dominion of Virginia with proper coastal protection!

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Honorable Mention, Essay Competition, 1921

What Ails Our Fire Control Telephones?

By Major Louis B. Bender, Sig. Corps

A MAJORITY of our Coast Artillery personnel seems to be in agreement that the present fire control telephone system for coast fortifications is decidedly sick, but few to my knowledge have attempted a logical diagnosis of the ailment with a view to applying a remedy. There probably has never been an extended drill period or target practice at a major caliber battery or equivalent command without telephone troubles of one sort or another. One of the most frequent complaints of the telephone operator is "I can't hear him;" "he sounds a thousand miles away." This trouble results in almost constant "repeat" calls and slows down the operation of the machine to an exasperating degree. What is the trouble? Can it be overcome? If so, how? The answer will be attempted in terms with which most Coast Artillery officers are familiar.

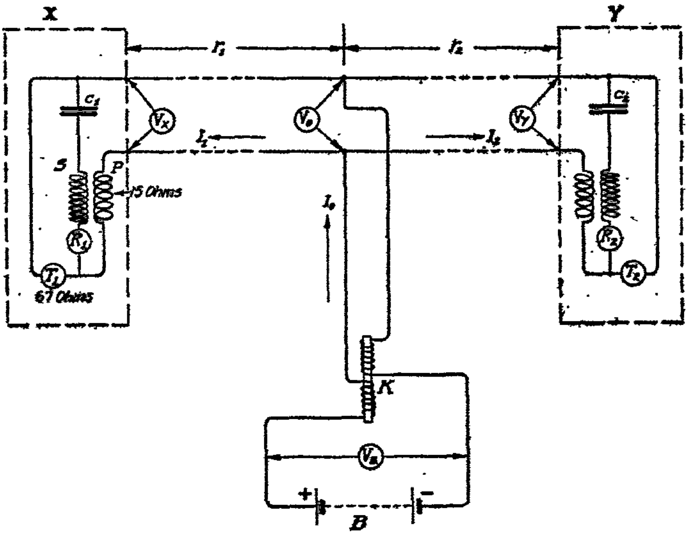
History of Telephone Development

The first use of telephones in our fire control system was at Forts Wadsworth and Hamilton about 1890. These first instruments were of the pure magnetic type: i. e., a metal diaphragm free to vibrate in a magnetic field served as both transmitter and receiver. A few years later the local battery system retaining the magnetic receiver but employing a carbon granule transmitter came into use and served acceptably until about 1902. The use of common battery systems was then coming into general commercial use and the advantages of that system over the local battery system in that service led to its adoption for fire control service also. These advantages consisted principally in the substitution of a single storage battery for the scattered primary batteries, and the simplified sub-station equipment made possible. Unfortunately however, the adoption of the common battery system for fire control work did not realize these advantages because the local batteries were retained as a reserve source of energy and retention of magneto signaling made it impossible to achieve the simplicity of visual signaling apparatus which was a feature of the commercial systems. The net result was a system more complicated than either the local or common battery systems of commercial practice, but possessing a rather doubtful insurance against interruption of service due to failure of the central battery.

The installation of these "composite systems" as they were called, was begun about 1904, and continued until about 1915, after which the local battery feature was omitted. Although no change has been made in the composite equipment previously installed, it is operated now almost exclusively on the common battery plan.

Battery Supply Loss In Common Battery Systems

With a view to determining the causes of the unsatisfactory operation which is so frequently reported, let us look into the theory of the common battery circuit as used in fire control systems. In Figure 1 we



Typical Fire Control Telephone Circuit 4052

FIG. 1.

have the typical circuit in which X and Y represent telephones, K a retardation coil, and B a 30-volt battery. Variations from this simple type often are found, for instance when both X and Y are on the same side of the battery B, or when two or more telephones are on one or both branches of the line. Considering for the present only the simple case shown in Figure 1, and assuming the transmitters of both telephones to be at rest, a direct current of constant value will flow from the battery B through the retardation coil K and divide between the two branches r_1 and r_2 of the circuit in the inverse ratio of the resistance of those branches including terminal apparatus. That is, $I_0 = I_1 + I_2$ and $\frac{I_1}{I_2} = \frac{r_2 + R_y}{r_1 + R_x}$. The potential at the terminals of the coil K will be

the potential of the battery *B* less the potential drop due to the current I_0 in the coil *K* or

$$V_0 = V_B - I_0 R_k \text{ where } R_k = \text{ resistance of coil } K$$

Likewise the potential at *X* and *Y* will be respectively

$$V_x = V_0 - I_1 r_1 \text{ and } V_y = V_0 - I_2 r_2$$

It is plain then that the potential at the telephones is always less than the potential V_0 at the terminals of the coil *K* depending on the length and character of the connecting circuit. But merely because the potential V_x is lower than V_0 is not a convincing argument that the transmission will suffer. It remains to be shown that the same current variation would not result in I_1 from variation of the resistance of the transmitter T_1 when actuated by speech whatever the potential V_x. We know certainly that the maximum current will be less as V_x is reduced, but we are not greatly interested in maximum currents. We are more interested in the amplitude of the current either side of normal, because upon this amplitude depends the amplitude of the induced currents in *S* which are the source of the high frequency transmission desired. Let us take first the case of a circuit in which r_1 and r_2 are both negligible in resistance. Laboratory measurements indicate that the resistance of a transmitter of the fire control type under consideration has a resistance of about 67-ohms when at rest and carrying normal current. The maximum and minimum resistances when the transmitter was actuated by speech was found to be 150 and 50-ohms respectively. We may proceed then directly to find the maximum and minimum currents for this short line condition when talking at *X*. Computations to accuracy of 10″ slide rule only.

Maximum transmitter resistance: minimum current

$R_x = 150 + 15 = 165$ ohms $\qquad\qquad R_y = 67 + 15 = 82$ ohms

$$R_0 = 80 + \frac{165 \times 82}{165 + 82} = 80 + 54.7 = 134.7 \text{ ohms}$$

$$I_0 = \frac{30}{134.7} = .223 \text{ amps.}$$

$$V_0 = 30 - (.223 \times 80) = 12.2 \text{ volts}$$

$$I_1 \text{ min.} = \frac{12.2}{165} = .074 \text{ amps.}$$

Minimum transmitter resistance: maximum current

$R_x = 50 + 15. = 65$ ohms $\qquad\qquad R_y = 82$ ohms

$$R_0 = 80 + \frac{65 \times 82}{65 + 82} = 80 + 36.2 = 116.2 \text{ ohms.}$$

$$I_0 = \frac{30}{116.2} = .258 \text{ amps.}$$

$$V_0 = 30 - (.258 \times 80) = 30 - 20.6 = 9.4 \text{ volts.}$$

$$I_1 \text{ max.} = \frac{9.4}{65} = .145 \text{ amps.}$$

Under conditions of negligible line resistance we have then a variation in current from .074 to .145 amps.

Now let us assume that *X* is 2 miles and *Y* 4 miles from K, the circuit being No. 19 B and S copper (standard fire control cable) whose resistance is 42 ohms per wire mile. Then,

$$r_1 = 2 \times 2 \times 42 = 168. \text{ ohms} \qquad r_2 = 2 \times 4 \times 42 = 336. \text{ ohms}$$

Assuming same variations in transmitter resistance as before, we may compute the currents when talking at *X*.

Maximum transmitter resistance: minimum current

$$r_1 + R_x = 168 + 165 = 333. \text{ ohms} \qquad r_2 + R_y = 336 + 82 = 418. \text{ ohms}$$

$$R_0 = 80 + \frac{333 \times 418}{333 + 418} = 80 + 186. = 226. \text{ ohms.}$$

$$I_0 = \frac{30}{226.} = .113 \text{ amps.} \qquad V_0 = 30 - (80 \times .113) = 20.5 \text{ volts}$$

$$I_1 \text{ min.} = \frac{20.5}{333.} = .0615 \text{ amps.}$$

Minimum transmitter resistance: Maximum current

$$r_1 + R_x = 168 + 65 = 233. \text{ ohms} \qquad r_2 + R_y = 418 \text{ ohms}$$

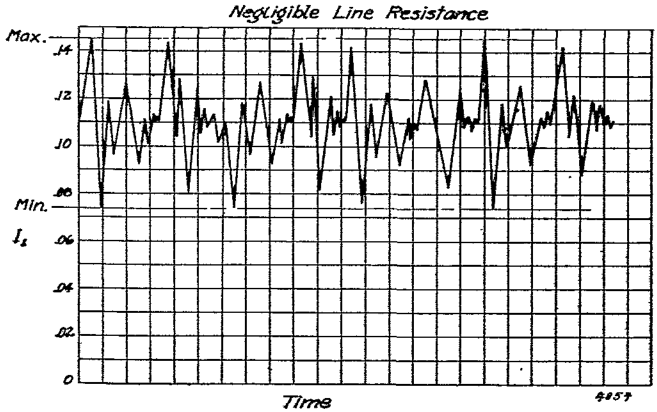
$$R_0 = 80 + \frac{233. \times 418}{233 + 418} = 80 + 150. = 230. \text{ ohms}$$

$$I_0 = \frac{30}{230} = .13 \text{ amps.} \qquad V_0 = 30 - (.13 \times 80) = 19.6 \text{ volts}$$

$$I_1 \text{ max.} = \frac{19.6}{233.} = .084 \text{ amps.}$$

For the assumed length of circuit then, 2 and 4 miles, the current at *X* varies during speech from .0615 to .084 amp. The variation at *Y* is still less due to the longer circuit involved. The results are shown graphically in Figure 2, where the wide difference between the current amplitudes in the two cases is readily seen. The form of the current waves shown is purely hypothetical, only the maximum and minimum being definitely determined, but it is plain that the high frequency current induced in *S* cannot have the amplitude in the case of the long line that it has in the short line because the current inducing it has a lesser am-

plitude. This induced high frequency current in the agency of transmission and the losses it suffers will be more fully discussed later on. But it should be clearly understood that irrespective of the attenuation of this high frequency current due to loss in the circuit between X and Y, the value of this current at the starting point X is materially less than it would be if this loss did not occur. In short, the transmitted current starts out under a handicap of decreased amplitude, notwithstanding the fact that it must suffer further losses along the transmission circuit



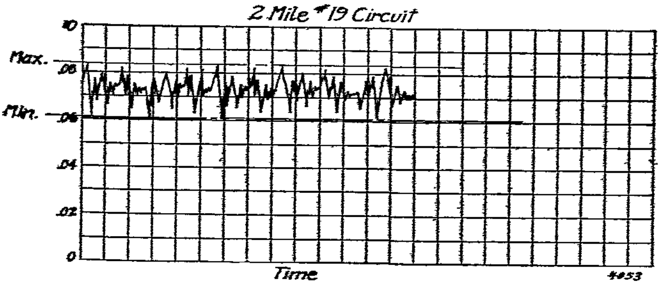


FIG. 2.

proportional to the length of that circuit. This particular cause of reduced efficiency is commonly known as the "battery supply loss." As the resistance of the connecting circuit increases, the effect is identical with a reduction in potential of the battery B. It should be noted that this battery supply loss is greatly increased as the number of telephones connected to a single circuit increases. For instance, if X is replaced by two telephones X_1 and X_2, the resistance R_0 of the whole circuit is decreased, an increased total current I_0 flows, the potential V_0 falls, the drop I_1r_1 increases, and the potential V_x is therefore less than before.

High Frequency Loss In Telephone Circuits

Let us turn from consideration of the battery supply loss to the principal other causes of poor telephone transmission. The human voice in producing audible speech sets up a complex wave motion in the adjoining media, the component frequencies of which cover the whole range between about 100 and 10,000 periods per second. This complex sound wave when directed into a telephone transmitter causes the transmitter diaphragm and its attached carbon electrode to vibrate at the same rate and to an amplitude proportional to this characteristic of the sound wave. The resistance of the carbon granule mass in which the electrode vibrates is likewise varied at the same rate and between limits proportional to the amplitude of diaphragm movement. The transmitter button containing this granulated carbon mass is traversed by the current I_1 (Figure 1) which also traverses the primary of the coil P. This current is a steady direct current when the transmitter is at rest, but becomes an undulating or pulsating current of a form similar to the wave form of the sound wave when the transmitter is spoken into. It never changes its direction, but only its amplitude. The variable magnetic field due to this pulsating current in coil P links the turns of the coil S wound on the same core and induces therein an alternating current of the same form and having the same component current frequencies as the sound wave entering the transmitter. This so called "high frequency" current traverses the condenser C_1 and receiver R_1, and then divides between two circuits; one, a local circuit through the transmitter T_1, and the other through coil P to line, the distant telephone, and return. The receiver R_1 thus responds to the induced current while a portion moves on to actuate the receiver R_2 at Y. In its journey from X and Y, this high frequency current is subject to certain losses which weaken or attenuate it. In the first place, there is the ohmic resistance of the circuit which dissipates energy in heat. Then there is leakage from one conductor to the other or from both to ground due to insufficient insulation. These factors have the same effect on high frequency alternating currents as on direct currents, but there are other factors which affect alternating currents and are immaterial to direct currents; namely, inductance and capacity. Any straight solid conductor possesses some self inductance, but its value in the case of the small conductors used in telephony is practicably negligible. This is not so with capacity, however, The capacity of aerial wires to ground is appreciable and the susceptance to high frequency currents considerable. But it is in cables that capacity really makes its presence known because the small distance necessarily existing between conductors in a cable as well as the higher dielectric constant of paper insulation over air increases the capacity of such circuits tremendously. The insulation of a cable circuit therefore might be compared to an electric sieve through which much of any

high frequency current is dissipated before reaching the point where work is to be done. The attenuation of transmitted currents resulting from the susceptance of the circuit varies directly as the frequency of the current. Susceptance may be expressed as

$$B = 2\pi fC \text{ where } f = \text{frequency and } c = \text{capacity}$$

If attenuation increases with susceptance, it should be plain then that the attenuation is greater for the higher frequencies than for the lower. In the complex telephone wave which contains frequency components between 100 and 10,000, a smaller proportion of the 10,000 frequency current is received at the distant station than of the 100 frequency. In long lines, the attenuation of the higher frequency currents is such that scarcely any of the frequencies above 2000 reach their destination at all. Fortunately, these higher frequency currents are not absolutely essential to make a conversation intelligible to the trained user of the telephone, but the distortion due to these varying degrees of attenuation makes it difficult for the untrained user to understand the resultant sound. The experienced user unconsciously supplies the deficiencies in amplitude of certain tones and readily recognizes them as all they were intended for. The necessity for training of telephone operators is therefore based on a scientific fact which may not generally be recognized. In addition to the distortion in wave form referred to, the higher frequency currents are displaced in phase from the initial phase more than the lower frequency waves. The result is that the phase relations existing in the received currents are different from those in the sent currents. This fact would make telephone conversation impossible over any but very short lines except for the remarkable fact that nature has given us an ear which does not demand that the original relations between sound waves be maintained. The duration of each frequency is sufficiently long to overlap the adjacent frequencies so that the proper combination is still maintained even though the beginning and ending of each is not precisely in the original time relation to all others.

Transmission Equivalents

It might appear hopeless under the foregoing conditions to calculate the attenuation to be expected in any telephone circuit; and so it would be unless it could be considered as a single frequency problem. In reality, it has been found that if a frequency of 796 cycles per second is assumed as the average for the transmitted waves, the computations of attenuation, received current, etc., will agree so closely with observed results that the calculations are good for all practical purposes. These computations are not for the ordinary telephone worker, however, for they involve the use of hyperbolic trigonometry, which while not inherently more difficult than circular trigonometry, is not so generally studied or taught. But telephone transmission problems have been

put on a practical basis by the general acceptance of certain standards of transmission by the telephone profession, these standards being expressed in terms which are quite understandable to the average worker. For convenience, a very simple type of circuit as shown in Figure 3 is taken as this standard. It consists of a variable length of artificial No. 19 gauge cable of .054-mf. capacity and 88-ohms resistance per loop mile with a standard common battery substation set connected through a repeating coil and 24-volt battery at each end. The apparatus code numbers indicated on the circuit drawing are those of the Western Electric Company. It will be noted that this circuit eliminates all battery supply loss since the battery is located directly at each transmitting station. The number of miles of No. 19 gauge cable of the above

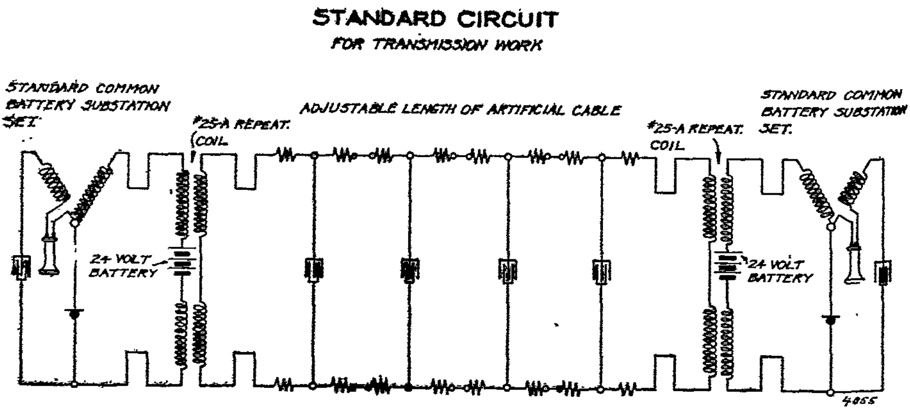


FIG. 3.

TRANSMITTER NO. 229
RECEIVER NO. 122
INDUCTION COIL NO. 20
CONDENSER 2 M F P

constants which has to be placed in the "standard circuit" in order that it shall give the same transmission as the circuit being measured, is then stated as the transmission equivalent of that circuit. This arrangement can be used for determining the transmission equivalent of a line circuit alone, of substation sets alone, of any telephone apparatus used in a circuit, or of all combined. Fortunately for our present purpose, the standard cable used corresponds closely enough in its characteristics with our standard paper insulated fire control cables, that we may use the equivalents directly without the necessity for applying correction factors. The transmission equivalents of several types of lines as determined by the method outlined are shown in the following table:

Type of line	Transmission equivalent per mile
No. 22 gauge paper cable	1.6
No. 17 gauge copper-steel, outside twisted pair	1.7
No. 14 gauge bare copper, standard spacing	.132
No. 12 gauge bare copper, standard spacing	.079
No. 8 gauge bare copper, standard spacing	.035
No. 14 gauge bare iron, standard spacing	.4
No. 12 gauge bare iron, standard spacing	.32
No. 10 gauge bare iron, standard spacing	.25

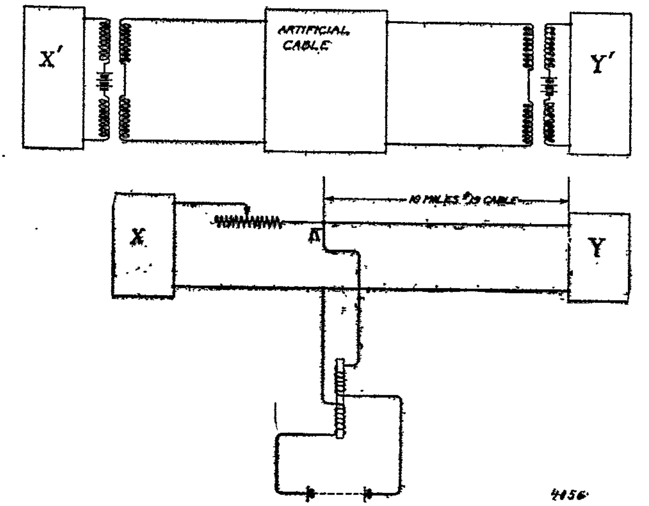
Referring to the first line of the above table, the transmission equivalent of 1.6 for No. 22 gauge cable simply means that one mile of such cable circuit will give the same results in transmission as 1.6 miles of standard (No. 19) cable. Consequently the maximum possible length of such circuit will be less than a No. 19 gauge cable circuit in the ratio $1/1.6=62.5\%$. The materially lower transmission equivalents of open wire lines, either copper or iron, are worth noting. The increased efficiency of such lines is due somewhat to their lower resistance but principally to their lower capacity. Up until a few years ago, a transmission loss from all causes equivalent to thirty miles of standard cable was considered by the commercial operating companies as the maximum which could be tolerated for long distance work. Any circuit in which the losses exceeded this figure was practically impossible for satisfactory conversation. A laboratory trial of a telephone working through thirty miles of standard artificial cable will convince anyone that such a limit could not be exceeded with much hope of successful conversation. In recent years however, the development and extended application of line loading and the vacuum tube telephone repeater has made it comparatively easy to keep all long distance circuits well within the thirty mile limit and there is a tendency to look upon twenty-five miles of standard cable as the transmission equivalent which should not now be exceeded in long distance circuits. For local exchange work, the practice differs with different localities and operating companies from twelve to nineteen miles of standard cable. Obviously, local telephone transmission ought to be of better quality than exists in long distance work and it is comparatively easy except in the largest cities to maintain a higher standard. There is no reason why the military service and the Coast Artillery in particular should be satisfied with a telephone service of lower standard than commercial companies have voluntarily set for themselves. It is even questionable if the Service should be satisfied with the same standard, provided it is physically possible to improve upon it. And our standards ought not to be based on long distance standards but on local service standards, because fire control work is essentially a local service when gauged by distances involved. If this

contention is well founded, then we ought not to be satisfied with a transmission loss in any fire control circuit in excess of sixteen miles of standard cable. If that limit cannot be met by the present system, then the system should be changed to one which can meet the situation. Any attempt to raise this limit above sixteen miles to fit the present or any other system is certain to result in a service which is both unsatisfactory and unreliable.

In addition to the battery supply and high frequency losses mentioned, transmission efficiency may suffer from abnormal losses in design of the apparatus used, its circuit arrangement, method of use, or its maintenance. It is conceivable that poor telephone transmission might result where extreme care had been taken to reduce both battery supply loss and high frequency loss if the terminal apparatus itself was inferior in design, construction, or maintenance. Is it possible that some of our troubles may be due to such causes?

Measurement of Transmission Equivalent

In order to determine the performance of our standard fire control telephone apparatus as judged by commercial standards, a rather extended transmission test has been conducted. A typical circuit was set up as shown in Figure 4 with ten miles of No. 19 gauge paper cable permanently in circuit between telephone Y and the point K of battery supply. Telephone X was connected at K through a variable resistance which allowed the transmitter current I_1 to be varied to the several values it would have if the talking loop was increased by increments of one mile up to a ten mile cable limit. Alongside this circuit was the standard transmission circuit shown in Figure 3. The source of sound for the trial was a vacuum tube oscillator supplying current to maintain a tone of constant volume and pitch in a specially built howler, the pitch corresponding to 800 cycles per second. For any given condition of circuit between X and Y, the howler was placed directly in front of the transmitter at X and six inches removed therefrom while the volume of received sound at Y was read with an audibility meter. Then the howler was moved to the transmitter at X^1 and the standard cable adjusted until the same audibility indication was obtained in the receiver at Y^1. This procedure compared the whole fire control circuit including transmitters, receivers, induction coil and retardation coil with the standard commercial circuit and gave directly the equivalent of the former in miles of standard cable. The results for transmission in the direction from X to Y are plotted in Figure 5. Transmission results will always be different in the two directions due to unequal battery supply losses unless the point of battery supply is just midway on the circuit. Examination of the plot reveals that with zero talking loop at X, the resulting transmission was equivalent to about 24½ miles of standard cable while with a ten mile talking loop, the transmission equivalent was



CIRCUIT ARRANGEMENT FOR TEST FOR TRANSMISSION EQUIVALENT
FIG. 4.

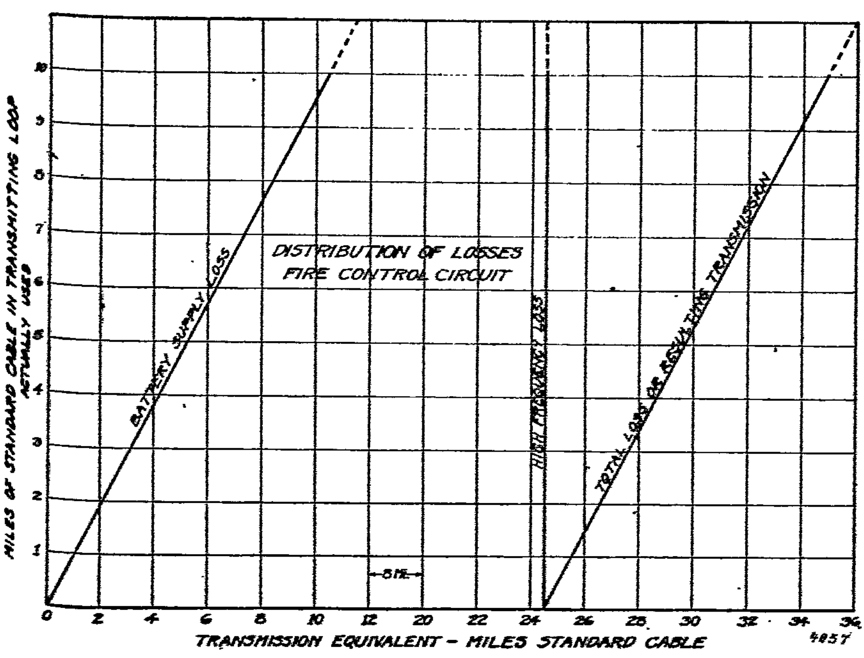


FIG. 5.

approximately thirty-five miles of standard cable. To determine how much of this loss occurred in the fire control transmitter and receiver, these were replaced with a transmitter and receiver of the standard type and the transmission equivalents for the two conditions named were found to be 15½ and 27½ miles respectively. The particular transmitter and receiver under test therefore were together responsible for a loss equivalent to approximately eight miles of standard cable. In the case of the zero talking loop, this leaves a loss of $24.5-10-8=6.5$ miles unaccounted for and which can only be ascribed to inferior substation circuit or method of battery supply, probably some of both. The chart (Figure 5) can be used to determine approximately the transmission equivalent of any fire control circuit. Assume for instance a circuit in which telephone X is one mile from battery supply point K and telephone Y is four miles from K. This is a very commonly met condition and the solution of this case will be of interest. Considering first the transmission from X to Y, we find from the chart that the battery supply loss for one mile of talking loop is about 1.1 miles. The high frequency loss occurs over a five mile circuit and since we have it for a ten mile circuit only, we must deduct five miles from the ten mile equivalent or $24.5-5.=19.5$ miles. The transmission equivalent of the whole circuit is therefore $1.1+19.5=20.6$ miles of standard cable. For transmission from Y to X, the battery supply loss is 4.3 miles, the high frequency loss the same as before, and the total equivalent $4.3+19.5=23.8$ miles. This method of computation is not strictly accurate but it has the advantage of simplicity and the results are sufficiently accurate for our present purpose. Recalling our previously advocated standard of sixteen miles and the commercial limits for local service as twelve to nineteen miles, is it any wonder now that our telephone service is not all we would like to have it? Incidentally, this bit of light may make us more sympathetic towards the electricians who maintain the systems and temper our demands for a service it is not physically possible to attain with the present equipment.

The considerably higher transmission equivalent of the fire control transmitter and receiver over the standard transmitter and receiver, (approximately eight miles), led to the suspicion that the particular transmitter and receiver under test were sub-normal in their performance. Seven additional head sets and one hand set were therefore obtained and substituted in turn for the original set under trial with results as tabulated on Page 33.

Three of these instruments were in their original packing cases as received from the depot and had never been in service. Five were obtained from a post where they were in service at the time and seemed to be in a reasonably good state of repair. The whole lot is representative of those which may be found in service anywhere at the present time. It will be noted that every transmitter and receiver of the head set type

	Transmitters		Receivers	
No.	Type	Equivalent compared to standard	Type	Equivalent compared to standard
1	Head set	−6.2 miles	Head set	−8.8 miles
2	Head set	−4.4 "	Head set	−4.2 "
3	Head set	−2.0 "	Head set	−4.6 "
4	Head set	−3.4 "	Head set	−6.9 "
5	Head set	−3.0 "	Head set	−3.8 "
6	Head set	−1.5 "	Head set	−15.2 "
7	Head set	−3.6 "	Head set	−6.4 "
	Average	−3.4 miles	Average	−7.1 miles
8	Hand set	+2.8 "	Hand set	+2.6 "

was sub-normal when compared to the commercial standard instruments, the equivalent being $-3.4+(-7.1)=-10.5$ miles for the average head set. In other words, the commercially standard transmitter and receiver with 10.5 miles of No. 19 gauge cable in circuit will give the same transmission results as the average fire control head set with zero line in circuit. If one very inferior receiver (No. 6) is eliminated from the results, the average equivalent is still in the neighborhood of nine miles which is much too great a loss. On the contrary, the hand set tested was better in both its transmitter and receiver than the standard by $2.8+2.6=5.4$ miles. Continued tests indicated that practically all the loss in the transmitter occurred in the long, curved, hard rubber mouthpiece which of course is absent in the hand set. The better performance of the hand set receiver over the head set receiver suggests that the inferiority of the latter results from the rubber ear-cap designed to exclude extraneous sounds but a high efficiency receiver with a different form of ear-cap gave an equivalent of +5.2 miles which goes to show that it is not at all impossible to get good results from a receiver with an ear-cap.

Comparison of Local With Common Battery System

One of the most serious objections to the common battery system for fire control installations is the tremendously decreased efficiency due to battery supply loss. Figure 5 shows the magnitude of this loss when only two telephones are connected to a circuit. This is the most favorable condition for the present system, but it will be noted that for every mile of cable circuit employed in the talking loop, a loss of something more than two miles of standard cable results; one mile from battery supply loss and another mile from high frequency loss. When more than two telephones are connected to a circuit, and this is almost the rule in

fire control systems, the battery supply loss is still further increased The BC-observer's line has normally three telephones connected and one at least is always a long distance removed from its supply. The gun line has usually three or more telephones and cases have been observed where nine telephones were connected to such a line, no one of which was nearer the retardation coil than a mile. That particular condition has not been investigated in detail, but judging from the results obtained in practice, it is my conviction that the transmission equivalent of that circuit approached thirty miles and by far the greater portion of that equivalent was due to battery supply loss. There are means for improving these conditions. For instance, two or more retardation coils, may be used on heavily loaded circuits with condensers between the separately fed sections of the line. Admittedly, this is an effective remedy, but it is obtained at the expense of simplicity and is not always feasible; for instance, in the gun line case named where all the telephones are at one end of the circuit and the retardation coil at the other. The length of fire control circuits is continually growing to keep pace with other developments and the absolute limit for common battery transmission is already upon us. Plans for a new fortification project recently prepared involved base lines between ten and fifteen thousand yards long and submarine cables carrying circuits for base end stations which would have been easily fifteen miles long. Unless special and expensive cables were used, common battery operation in that case would be impossible with the present equipment. One possible solution is the use of local battery circuits for these long lines, thereby eliminating the battery supply loss. But then we have a mixed system which is unwieldy in operation, particularly if the idea of switching lines within a command is generally developed and executed. The existence of local and common battery circuits in a single command would be almost fatal to any switching plan by reason of the complication in the switching apparatus and circuits necessary.

What then can be done about it? At the risk of classification as a reactionary, the claim is advanced that a reversion to the local battery system throughout the fire control system, combined with re-design of the sub-station apparatus is the best possible solution; in fact the only solution in sight for the present ills. The short-comings of the local battery system, as we have known it heretofore, in the expense and labor incident to battery renewals are fully recognized. Likewise, the convenience of the common battery system in this respect is legion. But, are we building fire control systems for convenience during the piping times of peace, or for knock-down, drag-out service in time of war? So long as a single gun remains in action, its personnel is entitled to all the assistance a communication system intact can give. Will the present system remain in action as long as the armament? Practically every officer knows down deep in his heart it will not. The composite system

afforded somewhat more protection against interruption than the present exclusively common battery system, but it too had its faults. The connecting circuits of any system are vulnerable but that is all the more reason for making every telephone an independent unit in its operation.

In still another direction, we are not yet out of the woods. How many officers have given serious thought to the problem of interconnecting the local battery system of a railway artillery unit to the common battery system of a Coast Defense when that unit becomes one of the Defense's tactical units, particularly if any plan for switching of base end stations and plotting rooms is involved, as it sooner or later will be? This is no hypothetical problem. Its presentation is solely a matter of chance. If we are lucky, it may be indefinitely postponed, but if unlucky enough to draw it, how shall it be solved? This is the second big consideration which makes a local battery system essential for the Coast Defenses. A solution might be sought in providing a common battery system for railway artillery, but that is believed to be highly undesirable. Although such action might simplify this particular situation, it would make the railway communication system subject to all the ills of the present permanent systems. In addition, the mobile character of railway units makes a central storage battery decidedly out of place.

The following specific advantages of a local over a common battery system for fire control installations are claimed and can scarcely be denied:

1. Improves the efficiency of transmission over all but the shortest lines and gives no lower efficiency there.

2. Increases the maximum possible length of circuits carried in cables to a point which is sufficient for all prospective fire control installations.

3. Simplicity in design and maintenance of switching devices.

4. Facility with which railway or motorized artillery units may be inter-connected with Coast Defenses.

5. De-centralizes the power supply and makes each telephone an independent unit in that respect.

But the reader may still doubt that these advantages are sufficient to outweigh the tremendous nuisance and expense of maintaining dry cells over a large and sometimes inaccessible area. The doubt is even more firmly fixed when we recall that failure to renew these cells when they have discharged to a certain degree is often more disastrous to transmission efficiency than the battery supply loss over the longest common battery circuit with which we may have to deal. But if this dry-cell nuisance could be eliminated, what further excuse would there be for continuing along the common battery line? Justification for such action would indeed be hard to find. The following plan is pre-

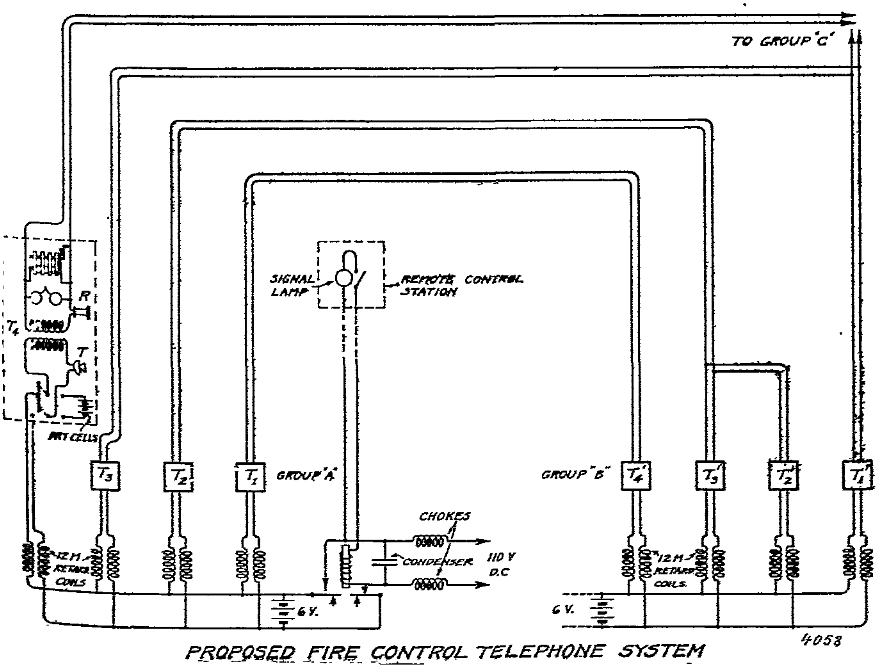
sented for a fire control telephone system possessing all the advantages heretofore outlined for local battery systems but avoiding the disadvantages ordinarily found in such systems.

Proposal For Type Telephone System

A casual mental survey of the typical Coast fortification will furnish support for the assertion that a large proportion of the telephones used are located in groups of varying size. The battery, for instance, whether gun or mortar, has ordinarily four or five telephones in each of three general locations; namely, the plotting room, the emplacements, and the B. C. station. Likewise, fire, fort, and mine commanders' stations each harbor a nest of telephones. Observing stations and searchlights are not infrequently so located that a considerable number of them fall within a comparatively small area; say, a circle of 100 yd. radius. No two fortified points would be identical in this respect of course, but in general these natural groups would be found. Why not then make each of these natural groups a unit so far as telephone power supply is concerned? Whereas the fire command is now the standard unit for such power supply, make these smaller groups the unit and make it essentially a local battery system by simply replacing all the dry cells in that unit by a single storage battery in that unit. If a well directed shell falls within the group, the storage battery may go out of commission with the rest of the armament and equipment in that group, but that need not affect the remainder of the groups which have been more fortunate in the battle. And in order that any telephone left intact may still be operative, if its circuit is unbroken, provide every telephone with space for the necessary dry cells to be inserted only upon outbreak of war and a simple switch for throwing the transmitter to the dry cells or the storage battery as desired. A typical installation of the kind outlined has been set up and subjected to very careful tests to determine its weaknesses and its capabilities. The circuit arrangement is shown in Figure 6.

At the extreme left, the circuit of the telephone itself is shown in schematic. The remainder of the figure shows only the supply of the lines from the 6-volt bus and the interconnection of lines between groups. Small retardation coils (WE Co. type 12M) having a resistance of 2.3-ohms are inserted between the battery bus and the transmitter to prevent any tendency toward cross talk. Using a 6-volt, 60-amp.hr. lead storage battery there was absolutely no evidence of cross talk and even an Edison battery which cannot ordinarily be used for telephone work without cross talk gave quite satisfactory results. The resistance of the circuit between the bus and transmitter is immaterial so long as each telephone has its independent supply circuit and the drop is not excessive. No effort was made to determine the transmission equivalent of the local battery arrangement shown in Figure 6 but there is no reason to believe that it would differ at all from the standard provided

the sub-station apparatus was equivalent to the standard and the designed voltage was maintained at the transmitter terminals. In order to assure the latter condition for all lengths of battery supply circuits within a group, a battery should be supplied having sufficient potential to maintain the designed voltage at the most distant transmitter. Small variable resistances should then be supplied for the shorter circuits to cut down the potential at those transmitters to the normal value. Every transmitter on the system would then have the working voltage for which it was designed and although there would be some waste of energy



PROPOSED FIRE CONTROL TELEPHONE SYSTEM

FIG. 6.

in the resistances, that would be an almost negligible consideration compared with the improved transmission efficiency.

For those few telephones which lie outside the natural groups, dry cells alone can be used. The number of such telephones will not be large, and the expense of maintenance therefore nominal. In order that the group batteries may be charged without the necessity for personal attendance on the part of the electrician, remote control should be provided along some such line as indicated in Figure 6. This arrangement allows the battery to be connected to the charging mains through operation of a relay near the battery controlled by a distant key. Although the circuit shown leaves the busses connected to the battery during

charging, the relay can be made to disconnect the busses from the battery during charging if desired. A lamp signal is provided near the operating key to indicate to the operator the action of the distant relay. Choke coils in series with the charging mains, assisted by a shunt condenser, smooth out slight voltage fluctuations so that the telephones may be used if necessary while the battery is being charged. The form of storage battery used is immaterial. The open glass jar with lead plates is easily inspected and maintained, but should have a cabinet for protection against mechanical injury. The portable type of lead battery similar to automobile batteries has the advantage of being easily moved to meet changed load conditions, has a wide commercial use, and needs less protection. The Edison portable battery shares the last named advantages and in addition will stand almost unbelieveable abuse but it will not work well in freezing temperatures and dampness will start corrosion of the cases if not carefully watched. The choice between these types rests largely in local conditions to be met. The capacity of the battery to be used depends on the number of telephones in the group the battery is to serve. The current flow is approximately 1/10 amp. for each telephone connected to the battery so long as the hook switch is up. Assuming a group of fifteen telephones and a war period which required an average of eighteen hours daily use, the demand per day would be $15 \times .1 = 18 = 27$-amp.hours. If we assume a charge only once in five days, the capacity should be $5 \times 27 = 135$ amp. hours. The use of any battery smaller than a 60-amp.hour capacity is not advisable because the higher internal resistance of smaller batteries makes cross talk a possibility, although no trouble of this kind was experienced with a 60-amp.hour battery during the trials. A glance at Figure 6 is sufficient to indicate the ease with which switching devices can be cut into such circuits. There is no danger, for instance, of short circuits due to improper poling of line circuits, of getting two telephones on a circuit without any retardation coil, and the results following the concentration of a half dozen or more telephones on one circuit are far less distressing than in a common battery system.

In the redesign of the telephones themselves, the transmitter deserves primary consideration. There is no question but that the present head-set is a good design mechanically and possesses some definite advantages over any breast transmitter, chiefly in the latitude of movement it allows the operator for his head without getting away from the mouthpiece. On the other hand, it makes use of only one of the operator's ears when two are none too many during the noise of action. But the really serious fault is the acoustic loss in the long curved mouthpiece as pointed out before. Some form of breast transmitter which holds the transmitter directly before the mouth with need for no more than a short flaring mouthpiece, combined with a double head receiver using high efficiency receivers and rubber ear cushions is believed to offer

the maximum promise of improvement over present equipment. Figure 7 shows two telephones of this general type which have been tried with very satisfactory results in the laboratory although the benefit of a service trial has not yet been obtained.

The attempt has been made to determine wherein the present fire control telephone system does not measure up to modern standards. There would be little satisfaction in ferreting out these deficiencies if they did not point the way to the remedy. In this particular case, the

FIG. 7.

remedy seems to be reasonably well established. It only remains to administer that remedy. There is not the slightest doubt but that the reasonable limits for common battery transmission have already been exceeded in many of our Coast Defenses and the extension of the same system to new fortifications can only bring disappointing results with the certainty of seeking and applying some remedy "eventually; why not now"?

Troop Leadership

By Lieut. Colonel W. G. Peace, C. A. C.

THE ultimate aim of all military activity is success in war. Assuming that the man power is available, this success depends upon three essential elements, namely, material, technical training and leadership. These elements may be considered of equal importance; for the lack of any one of them will cause failure when opposed by an enemy employing the three combined. Unlimited time and money have been spent in developing the best types of armament and equipment; the efforts devoted to technical training are well known to all officers and need no comment here. The army has been flooded with books, manuals and pamphlets on these subjects. But practically no attention has been paid to the third element of which Napoleon said "in war the moral is to the physical as three to one." Of the two hundred and five documents on the official list of the War Department publications, not one touches upon leadership, discipline, or morale.

It has been said that a leader is born, not made. This is to a great extent true in the United States army. If an officer is not a born leader he seldom becomes one; for the army until quite recently has done nothing to develop the requisite qualifications. There is no uniform policy in existence for carrying out such a scheme. Each officer is left to pursue his own course without the guidance or benefit of the experience of others. "The management of men is a vast unbounded sea upon which the young officer sails without pilot and without chart."

A leading army authority states in italics; "In plain truth the young American is more difficult to discipline than the soldier of almost any other nationality." In the navy the same view is held; "American officers have a more difficult task to handle and standard of leadership to maintain than the officers of any other nationality. The very superior mentality of our men imposes this."

The trouble, I think, lies in the fact that we are applying obsolete methods to human material. The system of developing discipline at West Point twenty years ago, and even up to the late war, would wreck any army which could now be raised in America. Fully realizing this, the present administration at that institution has put into effect a radical change, and will introduce the study of a text book setting forth the most advanced ideas on the subject. The days of the yapping corporal are past. The Commandant of Cadets stated a short time ago that the older graduates were almost unanimously in favor of the change.

The recent trend of the relationship between the employer and the employee in civil life renders imperative a modification of the old idea of controlling men in the military service. It is fully realized in industrial management that abusive arbitrary control kills teamwork and creates soreness and grudges with inevitable loss in efficiency; and that government by fear is inexcusable folly. The new relations between capital and labor are based on frankness, sincerity and intelligent understanding; efficiency is developed by patient instruction and explanation. The employee class which now furnishes the enlisted personnel of the regular army, and which will constitute by far the larger part of our future armies, is being educated along these lines and is becoming accustomed to such treatment. In order to obtain the best results, therefore, it becomes necessary to adopt a policy in conformity with the character of the men with whom we have to deal.

The future soldier must be led, not driven. This does not mean the establishment of socialism or soviet rule; it does not mean any division of authority between officers and enlisted men, or between the general and the officers under him. But it does mean that such a relationship must be established as will result in willing and intelligent obedience to the will of the commander by appeal to reason rather than by resort to force. If, however, appeal to reason fails, there is always force available as a last resort.

Leadership is an art, not an exact science. No rules nor set of rules can be laid down. But a recital of some of the cases which have actually occurred in the army may prove stimulating and helpful to those who care to apply to their own experiences the principles here suggested.

Successful leadership is based upon the application of sound principles to each unit from the lowest up. Beginning with the squad, the corporal in charge should be given authority over it and be held responsible for its efficiency and condition. Likewise the sergeant should be impressed with the idea that he has authority and responsibility. On the other hand the noncommissioned officers should receive privileges and consideration commensurate with their position. This has the double effect of making their office worth holding and of elevating them in the estimation of the privates. On a certain army post there were, a short time ago, sergeants of from fifteen to twenty five years service with character "excellent" on every discharge. In order to visit the village a mile away for an hour while not on duty, these sergeants were required to go through with the following procedure; the reader will have to bear with the details in order to catch the point I am trying to make. On the day before the proposed visit, the sergeant had to submit in writing his request giving time of departure, destination, time of return, and clothing to be worn. The company clerk tabulated this data, adding rank of applicant. The first sergeant signed the pass list. The company commander looked it over and added his signature. It was

then taken to the adjutant who approved in writing "by order of the commanding officer." The list was then sent to the guard house. On leaving the post, the sergeant reported there for inspection, giving time of departure and destination which were duly recorded. Upon returning, the sergeant was again inspected at the guard house and a written record made of his condition and the hour of his return. The pass list was examined by the officer of the day who took it to headquarters and formally turned it over to the commanding officer. The adjutant then inspected the records and the incident was closed. Upon instructions from Washington to reduce paper work as much as possible, the commanding officer decided to dispense with the adjutant's signature on the pass list. Otherwise the system remained unchanged. This case brings out two points. First, the failure to make any distinction between an old noncommissioned officer, holding a position of responsibility, and a new recruit. After years of faithful and efficient service, the sergeant was hedged about by senseless and worse than useless restrictions. Compare this with the status of the British noncommissioned officer with his separate mess, clubs, and liberal privileges. Second, the inability of some of the older officers, whose first impression of the army were formed many years ago, to adjust themselves to modern conditions. The commanding officer in question had been urged to adopt the good conduct pass card system which has been so successfully used at many posts.

The reduction of a noncommissioned officer should receive serious consideration. The captain has authority to manage his company as he sees fit. His acts are not subject to question by those under him. But he should remember that the mental attitude of the soldiers has a decided influence upon the success or failure of his administration. A reduction which is considered harsh or unjust by the enlisted personnel does not help morale. If on the other hand the captain can so handle the matter as to leave the impression upon the men that the punishment is merited, he will have the moral support of his organization. Too many reduced noncommissioned officers have a demoralizing effect upon a command.

Upon taking over a company, the commander should refrain from hasty radical changes. Evolution rather than revolution! New policies should be introduced only after thorough acquaintance with local conditions. The captain should not condemn the whole system because things are not running according to his preconceived ideas. The company got along before he arrived; and it will probably survive his departure. Some years ago, an organization was reported by an inspector as having been the best in the department. Its captain received official letters of commendation. He in turn congratulated his men. Everything was functioning smoothly. About a month afterwards there was a change of officers. The new lieutenant sent to take command looked

over the situation and on the second day sighed, "Well, if they leave me here long enough I may be able to brace up this outfit and make something out of it." Just what he made of it can be imagined.

The expression is often heard in the army, "Treat every man alike." The origin of this half-baked idea is unknown; but the words have been faithfully repeated with parrot-like precision. It is a serious error to follow such a rule. What is necessary for the control of one soldier will ruin another. The habitual drunkard may be put in the guard house to sober up; but confinement may destroy the ambition and self respect of a high spirited boy.

An officer of the day found written on a sentry box, "To hell with the United States army." He took the sentinel off post, locked him up, and preferred general court-martial charges against him for sedition. The accused was so exasperated that he refused to make any defense; he said that he came into the army to be a soldier, not a guard house inmate. It was only through the efforts of his friends that the fact was established that the objectionable remark had been on the sentry box at least a week before he went on guard. The following case illustrates the possibilities of a different course of action:

In 1914 a captain investigated trouble between two privates arising over the division of profits from bootlegging whiskey in the company. To one of the soldiers who had been in the service only a short time, the captain said; "X. . . . , I'm surprised to see you in this; you are clean looking; your clothes are neat; you have plenty of sense; you are too good a man to be mixed up in such a mess." Three years afterwards when the officer revisited that post, a fine looking young first sergeant came up to him, saluted, and said; "Does the captain remember me? I am the man he gave a talking to when he had command of the company. I got to thinking about what he told me; and now I am trying to make something out of myself." The sergeant had through loyalty and enthusiasm been largely instrumental in making a newly organized company the best on the post. You who think it is a waste of time and energy to have a heart to heart talk with a young soldier, at least withhold your criticism of those who do make the attempt. Such efforts have in many cases been without success it is true, but many a good man has been saved for the service by a word of encouragement or an appeal to his pride during the formative period of his character.

The officer who "treats them all alike" might save himself the trouble of imposing penalties by employing a cash register to ring up the nature and amount of punishment. The court-martial manual itself makes a distinction between men who may have committed the same offense. The offender who has previous convictions is punished more severely than the one convicted for the first time. The man whose character is excellent should receive special consideration. Explaining to the company that a good conduct record is a valuable asset and that it

will go far towards tiding the holder over difficulties, encourages efforts to establish such a record. But while treating all men exactly alike is worse than foolish, it must be remembered that playing favorites is well nigh fatal.

Never threaten. It is unnecessary. The expression "I will put the first man in the guard house who does thus and so" sounds on the face of it like strength and force of character. In reality it is an admission of weakness. It means that the officer will call to his assistance in handling the situation, the measures intended to be employed as a last resort. He voluntarily commits himself and invites embarassment. For a case may, and probably will, arise in which he will either have to carry out his threat under circumstances which will bring his good judgment into question, or he will have to suffer the appearance of backing down.

Absence of good order and discipline destroys efficiency; furthermore, it is an element of positive danger. There are officers who permit gambling in their barracks on the grounds that if the soldiers do not gamble in their own quarters they will go off and gamble at some worse place. This idea carried to its logical conclusion would populate the barracks with prostitutes in order to keep the men from houses of ill fame.

On a small southern post, open gambling was permitted in the day room of one of the companies. This led to other disorders. Noncommissioned officers on entering the room were forced to get up on a table and sing and dance for the amusement of the gang. When drunkenness and rowdyism became intolerable, the post commander sent out a patrol to round up the vendors of liquor. A mob of soldiers decided to attack the patrol. After the funeral services, which, by the way, were not held over the members of the patrol, inspectors and investigating boards were assembled to fix the responsibility. But the damage had been done.

There must needs be offense, but woe unto that captain who knowingly permits it in his own barracks.

With the exercise of judgment it is not hard to keep in touch with what is really going on in the company. A sergeant who is formally summoned and kept standing at attention in the office where others are present may or may not give information. But if while the sergeant is standing by superintending some work, the captain quietly joins him, discusses the work and then casually asks "How is the company getting along? anything going wrong with the outfit?", he is pretty apt to find out the existence of any serious conditions which might bring down an inspector upon him.

A matter that requires sound judgment is the dealing with complaints. Often the complaints are against some noncommissioned officer. The captain must support his noncommissioned officer in order to maintain

discipline; but an injustice, it not corrected, may defeat that very end. General Shanks in his "Management of the American Soldier" expresses his belief that the soldier should be required to obtain permission from his first sergeant before coming to an officer to state his case. On this point I must take issue with the general. Of course the commander has confidence in the first sergeant; otherwise he would not keep him. But there have been cases of confidence grossly betrayed. I rather agree with Colonel Andrews who gives as an example:

"In the midst of all the cares of building the Panama Canal, General Goethals still set aside one morning each week for his men; and among all those thousands of employees every Jamaican and Hottentot had the comfort during the week of knowing he could see the big boss in person on Sunday. His gang boss also knew that the Hottentot could go to see the general, which has a salutary effect on his methods—so in the end not so many went after all. Let every one know that any one having troubles may bring them direct to you and the troubles will rapidly diminish, and your time will be well repaid in added efficiency."

A safe rule to follow is never to place any obstacle in the way of your finding out what is going on in your company. Information is closely allied with security.

The power of example is especially strong. Cheerfulness, courtesy and energy are contagious. A neat officer gives no excuse for slovenliness in the appearance of his enlisted men. "Follow me!" is more potent than a chapter of exhortations. A company was engaged in some important work. It began to rain. The lieutenant got under shelter. One by one the men joined him. But when the captain came along and without a word began work himself, someone remarked "Well, if the captain can stand the rain I guess we can," and all got busy.

A well chosen slogan boosts morale. A company from one of the forts around New York harbor paraded down Broadway on the Fourth of July. Civilians recognizing it yelled its slogan as it passed. Every man of the company marched straighter and held his head higher with the pride of belonging to the organization. A captain had as his motto "100% efficient." One of his lieutenants was late for drill, said his watch had stopped, and stated besides that there had not been the usual time between first call and assembly. "Mr. Z...., I do not want to be unreasonable. Your excuses are good so far as excuses go; but (pointing to the motto on the wall) have you been 100% efficient?"

Not only should the soldier's pride in person and organization be developed, but also his pride and interest in his work. An ammunition train commander in France noticed that the trucks to which the drivers had given names were almost always in better condition than those not so designated. When chauffer Jones stenciled "Casey Jones" on his White reconnaissance car, that car became, in his mind, a personality, a member of his own family; it became his chief interest in

life. It took first prize in both corps and army motor shows. Let the man name his implement according to his own fancy. The gun that is credited with having fired the last American shot in the World War was affectionately called by its crew "Calamity Jane."

If Private Smith has a dirty rifle at inspection, don't center your conversation on the rifle. Talk to Smith himself, about *himself*, what *he* should do, the pride *he* should take in his rifle. Then if you get Smith in the proper state of mind he will have not only his rifle, but his other equipment in good order next time. *Work on the men, they are your tools*. Get the men in the proper spirit and the rest will follow.

Of almost equal importance with knowing when to direct the soldier is knowing when to let him alone. General Shanks states in the Infantry Journal: "Some of the hardest working officers I have ever known have been among the greatest failures with troops—they nag their men to desperation."

A battalion was making a two weeks march in the Philippines. One morning it started out at dawn and camped at noon, hot, tired and dusty. The men found a clear mountain stream near by and forgot their fatigue in the pleasure of a cool plunge. Their shouts attracted the attention of an officer whose pernicious activity impelled him to begin an "inspection." The row which he started resulted in his sending several of the men back to their tents in arrest. What should have contributed towards contentment was turned into a source of bitter resentment.

Be considerate. If the men are enjoying a Saturday afternoon game of base ball, let them alone unless there is really important business to attend to. Don't keep them beyond their meal hour if it can just as well be avoided. The commander who assembles his officers before breakfast on Sunday morning to discuss unimportant details for next Wednesday's drill is not building up enthusiasm for that drill.

The nagging officer often launches out upon a painful recital of how he always draws a rotten outfit from his predecessor and of how he spends his life in bracing up the army and making it what it should be. It would take a vision from heaven to convince him that half the troubles he sets about to correct are of his own making.

During the absence of a captain on leave, a lieutenant was in command of a battery in camp in the middle west. From his tent he called his orderly. A yell went up from the other end of the street. When the lieutenant rushed down to find out "Who did that? Who made that noise?" a yelp sounded behind him. As he ran up and down the street the noise became general. It is doubtful if the soldier who gave the first whoop knew himself just why he did it. When the captain returned, one half of his battery, including many noncommissioned officers, were in the guard house awaiting trial by general court-martial. Now that battery may not have had the best discipline in the army to

start with; but it certainly was in no better condition when the lieutenant got through with it. What would you have done had you been in the lieutenant's place?

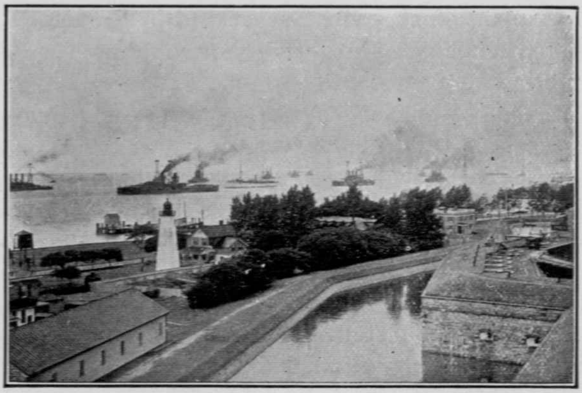
The fundamental principles which govern company officers in successful leadership apply with equal force to field and higher officers. But while the captain is primarily concerned with enlisted men, the colonel comes in closer contact with officers themselves. From him originates the driving power that keeps the whole machine in motion. A watch will run down if neglected. It has to be wound up every day. But you cannot expect it to keep time if you stick your finger into the works every five minutes. The application of this principle to the military situation is obvious. The colonel should direct, but should be careful to leave the execution in the hands of those whose function it is to carry out his orders. He must know the capabilities and characteristics of the officers under him in order to be able to select those best fitted for any particular work. The right men in the right places will insure a smoothly running machine.

The colonel should guard carefully the interests of every member of his command. Officers as well as enlisted men are much more contented if they feel that the colonel has their welfare at heart. He who holds a man back because he is "too good a man to lose" kills the goose that lays the golden egg. A plan which proved successful in France was to recommend for promotion any officer who showed himself especially fitted for such preferment, even though promotion meant the loss to the regiment of the most efficient officer of that particular grade. The system gave excellent results. Every captain tried to build up a company that would reflect such credit on the battalion commander as to ~~push him out the top. By doing so he was making a place for himself.~~ Likewise every lieutenant supported his captain, and so on throughout the regiment. This policy was supplemented by instructions that every man should have an understudy. Then when an efficient company clerk was called to headquarters, the captain had no excuse for saying that he could not get along without him.

Gambling for high stakes is a prolific source of trouble. Even moderate gambling has often led to friction.

The habit of "bawling out" a subordinate is pernicious in the extreme. It may possibly have been intended at first as a correction vigorously applied. But it often ceases to be corrective and degenerates into personal abuse. The officer who takes advantage of his position thus to vent his ill humor is destroying morale. He is a dead weight carried and supported by the discipline that others have built up. It is not proper to say that the custom has outlived its usefulness. It never had any usefulness. The officer who cannot control his temper is unfit for command. The sooner he is placed in Class B, the better for the service.

No officer can afford to neglect the study of leadership. Read books and articles on the subject; they will direct you along the right path. Watch men, both in civil and military life, who are known to be successful leaders; their actions and example will suggest ideas which will be invaluable. Learn to lead and control men and the rest will follow. No more fitting summary can be written than that made by Commander R. C. Parker, United States Navy, in his excellent essay on "Leadership": "In the final analysis, he who has mastered the art of leadership has mastered everything, since through others all other arts are subject to him!"



16-Inch Gun Making at Watervliet Arsenal

by Capt. L. A. Whittaker, C. A. C.

WATERVLIET Arsenal is located on the west bank of the Hudson River one mile from Troy, N. Y. and about five miles from Albany, N. Y. The Arsenal is often spoken of as the oldest in the United States, having been established in 1813. However, the buildings now standing were erected at a much later period. Some of the officers' quarters were built in 1848 and a few storehouses date from the Civil War period. Practically all of the new building was accomplished during the recent war and now that the gun making industry has slowed down only a few of the buildings are in use.

The Seacoast Cannon Shop which houses the equipment used in making large caliber guns was first designed and equipped on a scale sufficient to manufacture 12-inch, 50 caliber rifles. Much of the equipment installed twenty-five years ago is still being used to machine parts of the larger 14 and 16-inch rifles and howitzers. Larger and more recent type lathes were installed to take care of the 16-inch tubes and liners.

The Seacoast Cannon Shop consists of a main section, 75 feet wide and 1225 feet long, with a crane runway 56 feet above the floor line. Wings of the shed type section on the east and west sides of the main section increase the floor space considerably.

The machinery used in the manufacture of a 16-inch gun is not of great variety but it is of unusual size. Some of the largest boring and turning lathes in the United States are found at this Arsenal. The following dimensions of a large lathe will give some idea of the capacity of these machines. Length overall, 184′-11″; between centers, 73′-3″, the boring bar which carries the tool for boring out the tubes and liners is 72 feet long; the face plate is 120 inches in diameter and weighs approximately ten tons. The steady rests have a capacity of 66 to 88-inch diameter stock. The machine is equipped with carriages which carry the tools for turning off the surface of the forgings. This lathe was made by the Niles Bement Pond Co., and cost in excess of $125,000. In addition to large lathes the equipment also includes large boring mills, planers, scale capacity 300,000 lbs., and vertical boring lathes.

The cranes are a very important factor in handling the great weights and the main section of the shop is served by five cranes, one of 217-tons capacity, one of 170, and others of 100 and 30-ton capacity. The shrink pit is served by a 217-ton capacity electric crane which operates

on tracks in a special high lift section of the roof. The clearance of this crane above the floor line is 76 feet 6 inches.

The shrink pit is the name given to the section of the shop which contains the electric furnaces and the deep pits in which the guns are lowered in order to drop on the hot hoops or to assemble the liner. The pit is about thirty feet wide and about sixty feet long. One electrically operated furnace, consisting of thirteen sections, each section 88 inches in diameter and five feet high, constitutes the main heating unit. Two smaller furnaces, one a gas or rather oil operated furnace and the other an electric furnace are installed but seldom used.

The large electric furnace is about 71 feet in height while the cooling pit is about 105 feet deep. The whole shrink pit is below the surface of the floor and is served by an electric elevator. The electric furnace is controlled by a switchboard in a small gallery near the pit. It is possible to control the heat very easily and quickly as each section is equipped with a thermo couple and the temperature of the various sections of the furnace are indicated by means of recording pyrometers. With the present cable connections temperatures of 800 deg. Fhr are obtained without over heating.

The Forgings Used In a 16-Inch Gun

A short description of the forgings used in the 16-inch gun and the process of their manufacture are of interest to the Coast Artillery Officer, it is thought, and a few paragraphs on these are set forth below.

All forgings used in the 16-inch guns were made either by the Midvale Steel Co. or the Bethlehem Steel Co. and are of open hearth steel, the manufacture of the forgings being carried on under Government inspection and passing rigid tests before shipment to Watervliet Arsenal.

A short account of the steps in the making of gun forgings may be found in Tschappat's "Ordnance and Gunnery."

RESUME OF THE OPERATIONS INVOLVED IN THE MAKING OF GUN FORGINGS

1. Blast furnace reduces iron ore to pig iron.
2. Open hearth furnace makes gun steel from pig iron, steel or wrought iron scrap by the decarbonization process.
3. Metal is poured in ladle, then into mold. Open mold allows metal to cool without interference. Fluid process uses pressure to force out gases and make better casting.
4. Defects that may occur in casting of ingots—blow holes pipes and segregation.
5. Process after casting—discarding of thirty percent of total weight at top and five percent at the bottom of casting.
6. Heated in furnace before forging.
7. Forged by hydraulic press while hot. Hollow forgings.

8. Annealing, after forging, in brick-walled furnace.
9. Machining of soft forging to nearly finished dimensions.
10. Hardening in oil after another heating.
11. Tempering to restore toughness.
12. Testing for required specifications.

Upon the receipt of the forgings at the Arsenal they are identified by their serial number which is stamped on the end of the forging and they are inspected to see that the rough machining agrees with the specified dimensions and that the forging appears satisfactory as far as a casual inspection can indicate. Each forging is assigned to a gun by number and when a tube and a jacket have been assembled the two forgings are known as a "gun" from that stage of the manufacture on.

The history of the forgings of a 16-inch, Model 1919 MII will be traced and the most important characteristics noted, also a study of the operations followed in the production of the largest piece of ordnance made for the Coast Artillery. The 16-inch gun is of the wire wound type and consists of the following main parts, (see Figure 1):

The tube A forgings also called the liner.
The tube B forging.
The hoops, C, D, E, locking and small hoops or wire winding rings.
The jacket.
The locking ring.
The breech block.
The breech bushing.
The steel wire.
The recoil band.
The breech mechanism.
The bronze slides or splines.

In the assembly of these parts each must be accurately machined and fitted, the whole gun being held together by means of shrinkage and the wire wrapping. The tubes, A and B, the jacket, the locking hoop, the recoil band locking ring, the hoop C are made of alloy steel with a combined weight of 186,103 pounds.

GENERAL DESCRIPTION OF THE FORGINGS

Some idea of the size of the Tube A may be had when the following data is considered. This forging was made by means of a cylindrical, bored, fluid-compressed ingot the diameter of which was 60 inches and the length was 190 inches. The total weight of the ingot was 128,500 pounds. The top discard weighed 25,195 pounds while the bottom discard weighed 3855 pounds. The forging itself weighed 91,945 pounds before it was rough machined and 49225 pounds after. The overall length after machining was 811 inches, the outside diameter at the breech end 27.2 inches and at the muzzle end 19.9 inches.

The Government specifications called for the following; Elastic limit, 55,000 pounds, Tensile strength, 90,000 pounds. After a proper number of heat treatments the following values were obtained elastic limit, 60,000 and tensile strength 95,000 pounds.

The hoop D is the largest single element entering the gun. This hoop weighed in the ingot form, 266,000 pounds, a top discard of 89,000 pounds and a bottom discard of 13,400 pounds was made. The balance of the ingot, 136,400 pounds was used to make the forging for the hoop D which weighed after rough machining 81,159. In other words the hoop D when delivered to the Arsenal for the finish machine work weighed 81,159 pounds.

The above hoop under the pressure of the hydraulic press was evolved from an ingot which in the beginning measured 78 inches in diameter and only 140 inches in length. After it was rough machined it measured 426.3 inches overall length and had an outside diameter at the breech end of 53.75 inches and 38 inches at the muzzle ends. This hoop had nine different diameter zones or steps machined on its interior when finished.

Hoop D and hoop E are made of "gun steel." The total weight of the gun steel is 126,091 pounds. The breech block, breech bushing and the obturator spindle are made of "forged steel" which is of higher physical qualities than either the alloy or gun steel. The total weight of the forged steel is quite small being only 6,077 pounds. The physical specifications of the forged steel are very high, elastic limit, 75,000 pounds and tensile strength 110,000 pounds.

The Assembling of the Gun

The various forgings which go to make up the gun must be very accurately machined. The most exact measurements are demanded in work of this nature, in many instances the dimensions must not vary more than one one-thousandth part of an inch. Some idea of the accuracy that it implies will be better understood when one realizes that the human hair averages from two to three one-thousandths part of an inch in diameter and that the paper in the ordinary issue of the Journal is from three to five one-thousandths of an inch in thickness. Such exact measurements call for special measuring instruments and these consist of large outside calipers with micrometer attachments capable of measuring diameters up to sixty inches and more, verniers which can indicate to one one-thousandth of an inch and 200 inches in length, and standard comparator which is used to check the verniers. This comparator is capable of measuring to within an accuracy of one-ten thousandth of an inch. Another important measuring instrument is the star gauge apparatus. This instrument is of interest to the Coast Artillery Officer as its use in the field is sometimes necessary.

The star gauge equipment is used to measure the interior diameters

of a gun, tube or hoop. It consists of a sectional, hollow, brass rod, which is graduated into one-quarter and one inch divisions. This brass rod has, on the end that enters the bore of the gun, a head which carries three arms or points spaced 120° apart. Inside of this head is a cone shaped piece of metal which is attached to a square rod which in turn moves inside the hollow brass rod. At the operator's end of the brass rod a micrometer handle actuates the square rod. A movement of the micrometer handle will force the cone in or out of the head and in so doing the rod arms or points, the lower end of which rest on the surface of the cone, will move in or out. A small spring on each point keeps the point in contact with the cone. The star gauge is used as follows: Suppose a 16-inch tube B is to be measured, the diameter of the first part of the tube is found from the drawing and the micrometer handle and the proper size points are assembled to the hollow brass rod. A standard ring is used to set the points to the desired diameter and then small variations are read from the micrometer handle as the rod is pushed thru the bore of the tube. The rod can be increased to any desired length by adding sections, each of which are 100 inches in length.

As the gun is assembled the star gauge records show to what extent each additional step in the assembly has effected the compression of the inner bore. This record is very important as the various shrinkages differ in their compression factor and the total compressive effect must be found in order to check the strength of the gun.

As stated above the first step is to properly machine all the forgings which go to make up the gun. It would be of doubtful interest in this paper to enter into a detailed account of the machine operations in preparing these forgings for assembly and if the reader will keep in mind that the various parts are finished machined the remarks will be confined to the assembly of the gun only.

Assuming then that the B tube has been machined and star gauged the first step in the assembly is to wrap on a certain amount of steel wire. The wire winding is carried forward until the diameter of the tube and wire reaches thirty inches. The wire winding machine is simply a large lathe with a special traveling carriage which carries the reel of wire and puts the wire under a tension of 50,000 pounds per square inch before it is wound on the gun. The wire goes around several drums or rollers in order to acquire the necessary tension.

The tube is removed from the lathe, star gauged and placed in the shrink pit where the jacket is now shrunk on. The jacket is heated in the electric furnace until it expands sufficiently to allow it to slip over the wire surface and the breech end of the tube B. This expansion amounts to about .16 of an inch and it takes about 14½ hours heating to cause the metal to expand to this amount. The highest temperature reached is about 800° F. When the proper expansion has been obtained the jacket is lifted out of the furnace and put on the tube B while hot.

Cold water is circulated thru the interior of tube B and cold water played on the surface of the jacket in order to hasten the process of cooling.

After the jacket and tube have been assembled the unit is called a gun in shop parlance. The next step is to star gauge the bore in order to record the changes caused by the shrinkage of the jacket. After this is done the gun goes back to the wire winding machine for further wire. The next step is to assemble the C hoop, also called the muzzle hoop.

The muzzle hoop is larger than the jacket and we find that it takes about eighteen hours of heating before this forging expands to the required amount, .155 of an inch. The high temperature is again 800° F. The star gauging of the bore after this operation gives us more data regarding the compressive state of the inner bore.

The winding is again resumed and this time is finished. The winding now extends from the muzzle to a point near the breech end of the jacket varying from four layers at the muzzle to forty-eight over the breech end of the jacket. In all there are about 90 layers of wire on the gun but of course all of these do not over lap. A reference to figure 1 will show the details of the wire winding as well as the assembly of the hoops.

When the wiring is completed the surface of the wire and the muzzle hoop is turned off in readiness for the shrinkage of the D hoop. Before the shrinkage and also after the operation the star gauge is called upon to record the changes in the bore of the gun. The D hoop is the largest hoop and we find that it takes abour twenty-eight hours of heating in order to expand this forging .193 of an inch. The highest temperature in this case is 600° F.

A return to the lathe for more exterior turning makes the gun ready for the assembly of the E hoop which requires some sixteen hours heating to reach 650 deg. F and provide the necessary .2235 expansion. After the proper dimensions are reached in the bore of the B tube the gun is ready for the dropping in of the liner or A tube. The gun itself is placed in the furnace this time and is heated for some thirty hours until a temperature of 250° is reached. This provides an expansion of approximately .04 of an inch which is sufficient to allow the cold liner to slip into place. The interior of the liner is kept cool by circulating cold water through it while the cooling of the gun itself is hastened by a stream of cold water played on the outside. The liner is put in place as the last operation as it has been found in practice that when the gun is returned for relining the liner can be dropped out much more readily than if it were assembled first and the gun built up around it instead of the B tube.

The above steps complete the shrinkage operations and it now undergoes the final boring out for the powder chamber and forcing cone, centering slope and the gas check seat. The threads for the breech

ring are also cut at this time. The final turning off the metal from the exterior is next undertaken and the gun is then ready for the rifling process. The star gauge record is taken before the rifling.

The rifling machine consists of a frame work which carries a long bar called the rifling bar. This bar carries a special head which in turn has attached to its outer circumference the cutters, or tools which cut the grooves of the rifling. All the grooves are cut a small amount each time the head is run thru the gun. As there are 144 groves and 144 lands it means a great saving in time to cut all the grooves at one operation.

After the rifling is finished the gun is star gauged for the last time and is then sent to the south end of the shop for the fitting on of the bronze slides, recoil band, breech ring or bushing and the assembly of the breech mechanism.

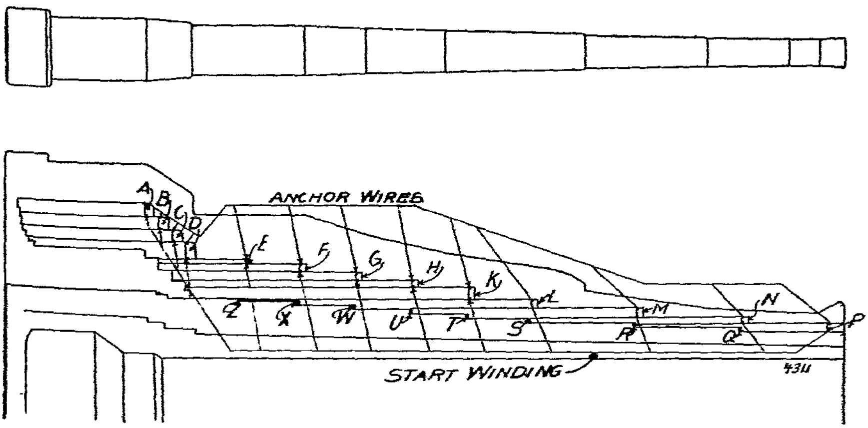


FIG. 1.

The breech mechanism of this gun is a departure for the Army and a word of description may be of interest. The block itself is of the step thread type and has twelve threaded sectors and three blank sectors. The block is hung on a carrier which is hinged on the recoil band and two points. The block is closed by the action of compressed air acting on two powerful springs which are attached to the carrier itself. The block operation and general design is similar to the Navy type.

After the breech mechanism has been fitted, which operation requires considerable time due to the large amount of hand and bench work involved, the stamping of the model, name of the manufacturing arsenal, year made and other data on the breech and muzzle of the gun is completed and the gun is made ready for shipment.

The above remarks close the description of the assembly of the gun as far as the work at Watervliet Arsenal is concerned.

From the arsenal the gun may either be shipped to Watertown Arsenal for trial assembly to its carriage or it may be sent direct to Aberdeen Proving Grounds for its firing and proving tests.

Below appears a resume of the steps followed in assembly. It is thought that this will fix the process a little more firmly in mind.

Operation No.	Description of Operation	Operation No.	Description of Operation
1.	Finish all forgings.	15.	Star gauge.
2.	Star gauge bores of all forgings.	16.	Shrink on E hoop.
		17.	Star gauge.
3.	Wind wire on B tube up to the 30 inch diameter.	18.	Shrink liner and finish bore.
4.	Star gauge	19.	Star gauge.
5.	Shrink on jacket.	20.	Finish turn.
6.	Star Gauge.	21.	Star gauge.
7.	Wind on more wire.	22.	Rifle.
8.	Star gauge.	23.	Star gauge.
9.	Shrink on C hoop.	24.	Fit bronze splines.
10.	Star gauge.	25.	Fit recoil band.
11.	Shrink on locking wire.	26.	Fit breech mechanism.
12.	Finish winding wire.	27.	Disassemble recoil band and breech mechansim.
13.	Star gauge.		
14.	Shrink on D hoop.	28.	Paint, grease and load for shipment.

LIST OF IMPORTANT FORGINGS AND PARTS.

A tube or liner.
B tube.
Jacket.
Hoop C, D, E and in some cases F.
Locking hoop.
Locking ring.
Recoil band.
Breech ring.
Breech block.
Steel wire.

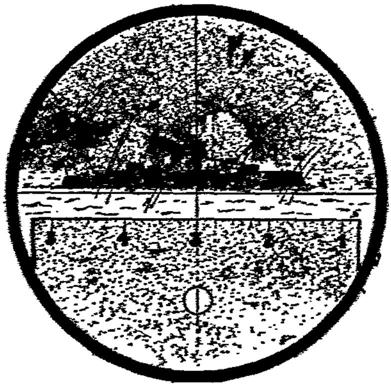
DATA CONCERNING THE GUN

Name, 16-inch B.L.R., Model 1919 MII, for barbette carriage, Mod. 1917.
Length, 68 feet, 7 inches.

Weight of gun alone	319,350 pounds.
Weight of breech mechanism	3,808 "

Weight of recoil band	56,750	"	
Weight of gun, complete	379,908	"	or 189.9 tons.
Weight of projectile	2,400	"	
Weight of powder charge	850	"	
Max. pressure developed	38,000	"	per square inch.
Approximate range	50,000 yards or about 28.4 miles.		
Energy of recoil	4,567,000 foot pounds.		
Muzzle velocity	2,700 feet per second.		
Rifling	144 lands and 144 grooves.		
Amount of wire wound on gun,	79,400 pounds or about 283.06 miles.		

A special flat car is needed to transport the gun and the problem was solved by using two ordinary flat cars which are connected by means of a bridge-like set of girders. The bridge is pivoted at the center of each flat car and the weight of the gun rests in the center of the bridge which is between the two cars. The arrangement allows the taking of short curves.



A Few Comments on Preparedness

By Major Raymond H. Fenner, C. A. C.

"The commanding officer of a company is responsible for the instruction, tactical efficiency, and preparedness for war service of his company, * * * * ."
—Par. 266, Army Regulations.

IF A. R. 266, and kindred regulations for higher commanders, mean anything they mean that in time of peace our whole system of training should be along lines that come nearest to simulating action in war. Yet in Coast Artillery instruction, drill, and service practice this point seems to be entirely overlooked. For by no flight of fancy can one picture that in war time would targets move so slowly, or opportunity ever be given for so much deliberation in preparing to fire, as is shown at service practice. Of course thoroughness is essential at target practice, in order that as much training and experience as possible be gained from each firing, but it is poor training that encourages the personnel to feel that time is not the important factor in all things pertaining to artillery work.

In order to formulate a plan of training that will actually prepare the coast defenses for war service, it is first necessary to study what any possible enemy may, or can, do in case of hostilities, and from this determine a course of action in advance, to meet every possible contingency. As the Coast Artillery must act purely on the defensive, prior preparation becomes most important. Every Coast Defense should have well defined plans prepared covering their particular defense problems, and this information should be thoroughly understood by every officer of the defenses.

Our knowledge of past events is the foundation on which we build our future anticipations. But, in searching history we find that rarely has a coast defense been called upon to repel an attack from a naval force. Much has been written as to how such an attack would be made, still the fact remains that it has seldom been attempted. During the World War it was clearly demonstrated that an attack on fixed fortifications is a very hazardous undertaking, and one with little chance of success. The defenses of the Dardanelles were far from modern, still they were sufficient to prevent the forcing of a passage, even though subjected to a very heavy attack. And the batteries that the Germans installed along the Belgian Coast were a sufficient threat to prevent the English from even trying to force a landing in the rear of the German lines, though the successful outcome of such an undertaking would

have been so momentous. And Heligoland we know was not so heavily armed, yet there was not a shot fired at it during the four years of war. In other words it is quite evident that naval commanders have a very healthy respect for the power and accuracy of fixed armament. So a deliberate attack on a fortified harbor is a very remote probability. If circumstances required that it be attempted it would no doubt take the form of a long range bombardment, at least in the earlier stages, and as the present naval guns completely outrange us, the only preparatory work—except possibly the use of a smoke screen to obscure the enemy's target—would be to instruct the personnel how to dig a deep hole expeditiously and crawl into it.

As a result of the recent Arms Conference, the preservation of the few capital ships remaining will be even more vital to all concerned, and the commander who risked his ship within range of fixed defenses would be hardy indeed.

But the World War did indicate that there are at least two forms of attack that we should be prepared to meet at any time, either of which might occur simultaneously with a declaration of war. That is, raids on more or less exposed coast towns or cities by squadrons of fast cruisers, or their bombardment by submarines. Either one of these attacks might be directed against a fortified place should the defenses not be sufficiently alert, and speedy enough in their work to prevent it. In other words, as things now are, our principal instruction should be directed to preparing the defenses to meet attacks from the air, raids from fast cruisers and bombardment from briefly exposed groups of submarines: that is, our most probable targets are fast-moving or briefly exposed ones, requiring prompt action on the part of the defenses, or the "show" will be over before they fire a shot. And we should habituate ourselves to the thought that there will be little warning of an attack. It will not be a case of a fleet appearing off-shore some clear day, and steaming up in battle formation to deliver its fire. What we should accustom ourselves to expect is brief uncertain glimpses of ships obscured by fog, mist, or smoke screen, or briefly outlined by the uncertain rays of a searchlight, suddenly spurting out a few broad-sides, and fading away again. They will have a whole city for their target, so do not have to see very much to get results, whereas the defenses will have to fire quickly and accurately or their efforts will but encourage the enemy to attempt further depredations.

Therefore all our instruction and drill should be along lines that will speed up our present way of doing things; speed up the drill; speed up service practice; and most of all, speed up the target. It is positively criminal to go on as we are now doing, firing at a target moving at six or eight knots an hour, and holding a carefully predetermined straightaway course across the face of the battery. It gives gun pointers and observers no experience in following rapidly moving targets, and gets

plotters to expecting small angular changes in the successive positions of the target, and predicted points habitually straight ahead. Whereas no ship under fire is going to hold a straight course, constant practice is going to be necessary if plotters are ever able to out-guess even occasionally a target on a zig-zag course. Therefore, let us speed up the target, as the first step. If nothing better can be obtained let each coast defense be supplied with a fast motor boat, that can itself be the target at drill, and if a large boat, say some of the obsolete types of Navy torpedo boats, can not be obtained to tow the target at service practice, then a target of the type that can be towed by the motor boat should be devised. A small boat, nonsinkable and with a modified hydroplane bow and fin keel equipped with a triangular, red or black, sail is suggested as a possible solution.

But there is no object in speeding up the target if work at the battery is not also speeded up. As a preliminary to this, the expeditious manning of the battery and its stations should be insisted upon as the beginning of each day's routine. Speed is not made emphatic enough in Coast Artillery drill. The Infantryman takes it as a matter of course that he will double time when advancing by rushes; the Cavalryman, that he will gallop when making a charge; and the Field Artilleryman, that he will go into battery on the run if under fire: so why not drill the Coast Artilleryman to feel that it is the natural thing to put all possible speed in preparations to fire? Drill is where the others learn to expect speed, so why not he?

Companies should not leave their barracks till every position on the manning table is filled with a properly instructed man, and details for stations more distant from the barracks than the battery should move out ahead of time, to schedule, so that all elements of the battery are manned simultaneously. When the company reaches the battery, stations should be taken at a double time, and a time limit should be fixed in which the battery is expected to report ready. And no battery should be permitted to report itself ready, unless it could at once begin firing were it ordered to do so, with the exception of removing ammunition from the magazine. The best way to insure this report being an absolutely correct one is to change the present system of holding target practice, and make it but a part of some one day's routine—in other words require batteries to fire without preliminary notice. Should a battery commander feel that any day he reports "ready" he may hear the command to "commence firing," he will be sure to know that "ready" means just what it says. Too often batteries are allowed to remain in a half prepared condition, day after day, till warned that target practice is imminent, when there is a mad last-hour scramble to put things to rights. The only way that a battery can be manned and made ready for action day after day, is to know that at the end of each day's work, everything has been left in first class working order. No day's work

should teminate till a thorough inspection, by all concerned, has been made of all matériel. Battery commanders should have daily check lists prepared showing all items that require a daily inspection to verify their condition. This must not be a perfunctory inspection but such a complete one that the battery commander *knows* that everything has been left in working order. The communication system probably requires the most careful supervision, for in it unexpected defects develop most often. But if forehandedness is used these breakdowns should be reduced to a minimum. A monthly megger test of all lines, a thorough weekly going over of all instruments, and a daily check, should be sufficient to determine any decrease in efficiency that may result in a break down in some part of the system.

Service practice as now conducted is too much of a bugbear to all concerned to be the real training experience intended. Requiring batteries to fire without preliminary notice should help this condition, it is believed. It will necessitate that all preliminary work be kept up to date, that blank forms are on hand at all times, that recorders of data are always available, and incidentally probably better instructed in keeping records, and that instruments and guns are always in adjustment. If there is anything required for target practice that would not be required in war time, except keeping records for future analysis, why require it at all? Requiring preparedness to this extent will leave little to be done when service practice is ordered, so there can be no excuse for delays.

In actual firing most battery commanders are too prone to make correction on insufficient data, every needless or wrong correction being at the expense of speed and best results. Ranging by salvos seems a futile thing. For the unknown errors of two guns are thus brought into the problem, and there are enough unknown factors without introducing needless ones. Firing two shots from the same gun, provided speed be used, will give far more reliable data on which to base an arbitrary correction. Unknown factors that result from the changing position of the target between shots will also be partly accounted for by this method, tending to greater reliability. But a minimum of time between shots is necessary in order that the conditions under which they are fired be not too radically different. No matter what method of adjustment of fire is used, no arbitrary correction should be applied till at least two rounds have been fired. And should any great dispersion result from these two shots, a third should be fired without delay, then the one that seems erratic should be rejected. In this connection let us not forget what that sterling Artilleryman, the late General Ruckman wrote for the JOURNAL, concerning the erratic behavior of first shots. His painstaking analysis of many practices bore out his contention. So the battery commander should be on the alert for the first shot doing the unexpected. Therefore, let target practice be started by firing two or

three shots rapidly from the one gun, and from the information obtained apply the necessary correction, not forgetting to include an increment due to change in range of the target, then fire at least two more shots before correction, till the adjustment is completed. The other guns can then be put in action. All prior practices of a battery should be analysed with a view to determining whether or not a modification to the arbitrary correction of the gun opening the fire will be necessary to put the other guns on the target. Theoretically a calibrated battery would not require this, but practically it's worth giving consideration.

Battery commanders, in making corrections, must not lose sight of the fact that the fall of any one shot merely indicates *one* of a great many points in the total rectangle as determined by the conditions under which that shot was fired; and a correction of n yards applied to that shot merely means that the next one will fall n yards from the first, plus or minus the length of the 100% zone, or plus or minus any fractional part of that zone. Thus, firing a gun with a probable error of 50 yards, an arbitrary correction of 200 yards might result in the next shot falling 500 or 600 yards away, or it might hit at practically the same point as the first, and still the gun would be responding strictly according to probabilities. When this does occur it is difficult for the inexperienced battery commander not to lose his nerve and apply some wild correction that completely wrecks the whole adjustment. A little thought should convince any one of the folly of attempting too fine adjustments at a moving target, or applying corrections at all without sufficient data upon which to base a correction of any kind. Yet I doubt if there has been a season's service practice fired in the last twenty years when several battery commanders have not attempted a 25 or 50 yard correction in the hope, by doing so, of wrecking the target. If data obtained from any one shot or salvo is not promptly applied to the succeeding shot it is of little or no value, when firing at a rapidly moving target, so speeding up firing is more liable to produce correct results than futile minute corrections. Hits are more or less a matter of chance anyway, and should not be given as much weight as the fact that the battery commander has applied the proper corrections to put the target in the 50% zone and keep it there. Major Gray has very aptly pointed out that that is about as good as we may hope to do in firing at a moving target anyway. And when we consider the probable difficulties under which firing will be conducted in war time, this will certainly be doing good work. Certainly no ship is going to linger in that neighborhood if such an adjustment is accomplished.

The subject of defense against air-craft has not been included in the foregoing comments, as this particular phase of our defense problem is already shaping quite naturally towards a special service; for a combination of our own air forces and anti-aircraft weapons must work in harmony to accomplish the best results in defending our fortifications. As

a further protection it has been proposed that we at once start camouflaging our emplacements, but this has met great opposition from those responsible for the appearance and upkeep of our fortifications. In addition it is a difficult and expensive, if not impossible thing to accomplish. Probably it is too late to do much in this respect anyway. Our happy-go-lucky way of permitting commercial planes to fly at will over our fortifications has furnished ample opportunity for the agents of foreign governments to do all the air photographing they could desire, and fortifications once photographed can scarcely be concealed by camouflage, due to the unchangeable nature of the natural objects and water lines in their vicinity. It would seem that a much less expensive, and more effective form of concealment for our fortifications than camouflaging our emplacements could be accomplished by preparing in peace time to project over any given area a smoke curtain that could be maintained while any enemy aircraft were overhead. Such a curtain would furnish a very material protection from air bombing, and should be easy to maintain except in very windy weather. But then that is the time when aircraft are at the greatest disadvantage, so the screen would not be so important.

The future development of aircraft is bound to have an effect on our method of emplacing coast defense guns. Whether or not the answer may be the employment of railroad artillery, or the development of a different type of carriage and emplacement, the future only can tell. But whatever the future holds, the present requires that we make the most of the matériel on hand, learn to serve it and preserve it the best we know how, so should emergency arise, we be found not wanting, but ready any hour of the night or day to deliver our full fire power with accuracy and *speed.*

EDITORIAL

A New Name for An Old Journal

WITH this issue, THE JOURNAL OF THE UNITED STATES ARTILLERY lays aside its time-honored name to assume one more truly descriptive and befitting—THE COAST ARTILLERY JOURNAL. After due consideration of the opinions expressed by many Coast Artillery Officers, the Chief of Coast Artillery has directed this change, believing that the more specific title is in keeping with the respect which we owe to the significant traditions of our own arm of the service.

It is to be remembered that when our JOURNAL was established in 1892, the entire artillery of the United States consisted of five regiments, with only 288 officers. Each of these regiments had twelve batteries, of which ten were coast batteries, and two were field batteries. So that at the time the JOURNAL was founded, five-sixths of all our artillery was Coast Artillery. The need for a JOURNAL was felt because the artillery was awakening from its long sleep since Civil War days, and the development of a modern technique and doctrine in both Coast Artillery and Field Artillery had just begun. In the early days of the JOURNAL, as the most cursory survey of its volumes will reveal, the challenge for progress, and the doors to be opened in the direction of investigation and invention, seemed to lay more immediately in the Coast Artillery path, so that from the first the JOURNAL OF THE UNITED STATES ARTILLERY was truly a Coast Artillery Journal. While the JOURNAL was catholic and impartial in its attention to every sort of artillery interest from 1892 to 1907, the date of the legal separation of the Coast Artillery and Field Artillery, yet during this period the progressive strides in Coast Artillery methods were so tremendous and so distinctive a process in the United States as compared with all other countries, that always the major emphasis of the JOURNAL rested on Coast Artillery problems.

Since the separation in 1907, the JOURNAL, as the third oldest of American service periodicals extant, deferred to what was conceived a time-honored tradition, in maintaining the name which is now laid aside. Nevertheless, as all know, ever since 1907 the JOURNAL has striven to fulfill its mission as "The Spokesman of the Coast Artillery Corps."

So, as the JOURNAL voyages forth again with the present volume, it embarks but the more truly under the colors and shield which it has always served. As we close one chapter and open another, it is not out of place to look backward and quickly scan the JOURNAL'S history.

With the close of the present year, the JOURNAL will have completed thirty years of service. In 1912, after twenty years, the JOURNAL began publishing a series of articles reviewing not only the history of the JOURNAL itself, but as well the progress during the JOURNAL'S life of the art of Coast Defense, including the improvements in gunnery, in ordnance, in mining, in tactics, and in organization. Today, after the lapse of ten years and with the supervention of the World War and its outlook, the Coast Artillery officer will find the reading of this series of articles even more interesting than when first they appeared. Even a recapitulation of the history of the JOURNAL and the contemporaneous progress of the Corps is out of the question here, but a few significant facts should be set forth.

Prior to 1892 the need for an artillery publication had been discussed, but it remained for a devoted little group of enthusiasts, consisting of:

1st Lieutenant William B. Homer, 5th Artillery,
1st Lieutenant Henry C. Davis, 3rd Artillery,
1st Lieutenant John W. Ruckman, 1st Artillery,
1st Lieutenant Cornelius DeW. Willcox, 2nd Artillery,
2nd Lieutenant Lucien G. Berry, 4th Artillery,

to enlist by correspondence from artillery officers promise for sufficient financial support, to assemble the material for a first issue, and to present to the then Commandant of the Artillery School, Colonel Royal T. Frank, a concrete proposition for producing a journal at the school's print shop.

With Colonel Frank's approval, the first number appeared in January, 1892. For the first four years of its existence, the JOURNAL appeared as a quarterly. During 1892, the control and editing of the publication was vested in a committee of the five officers named above.

Beginning with 1893, Lieutenant Ruckman was assigned as Editor, and served in that capacity to include 1895. To those officers who have had the opportunity to follow or to study the progressive development of Coast Artillery methods as we know them today, it would prove almost startling to observe the extent to which many of the devices and policies which are now so familiar as to be commonplace, had their genesis during the editorial regime of Lieutenant Ruckman. In the first four volumes of the JOURNAL may be found discussions or prophecies which embraced almost every detail of development which has subsequently taken place. While many of the ideas advanced were those of numerous officers who have since attained high rank and distinction, yet the internal evidence of the contents of these JOURNALS is conclusive enough

to justify the statement that it was the catholic interest and farsighted vision of Lieutenant Ruckman which imparted an impetus to Coast Artillery progress and to the standard for the JOURNAL. which have never since been wholly lost.

At the same time, the Coast Artillery owes a special meed of recognition to Lieutenant Willcox, now Colonel and Professor at the U. S. Military Academy, who not only shared in an equal degree with Lieutenant Ruckman the onerous effort of launching the JOURNAL, but as well was perhaps the first officer to visual the need and opportunity.

At the end of 1895, due to his impaired health, Lieutenant Ruckman was relieved as Editor, and in January, 1896 the position was assumed by First Lieutenant John P. Wisser, First Artillery, with Lieutenant George Blakely, Second Artillery, as assistant. At the same time the JOURNAL was changed from a quarterly to a bi-monthly, which it continued to be until May, 1919, since which time the JOURNAL has been published monthly.

During Lieutenant (and later Captain) Wisser's administration, Lieutenant Blakely was succeeded as assistant editor by Lieutenant Andrew Hero, Jr., 4th Artillery, Lieutenant C. C. Williams, 4th Artillery, and again by Lieutenant Hero.

After the promotion of Captain Wisser to Major in November, 1901, he was transferred to a new station in March, 1902. Captain E. M. Weaver, Artillery Corps, serving as temporary editor, brought out the March-April issue for 1902, while Captain John D. Barrette had charge during the production of the May-June number.

On July 1st, 1902, the new Editor, Captain Andrew Hero, Jr., Artillery Corps, assumed his duties, serving in this capacity until September 20, 1907, when he was relieved by Major Thomas W. Winston, C. A. C., who served until June 29, 1912.

Since then the Editors in order have been Major James M. Williams, C. A. C., to September, 1915, Lieutenant Colonel Henry D. Todd, Jr., C. A. C. to July 1917, Colonel John A. Lundeen, U. S. A. retired, until December, 1918, Colonel Robert R. Welshimer, C. A., to September 30, 1919, succeeded on October 1, 1919 by the present incumbent.

During all these years of the JOURNAL's history its policy has gradually changed to conform to the modifying trend of thought and policy of the Coast Artillery. Furthermore in later years, as at the present time, the editorial policy has been directed by the Chief of Coast Artillery. It is not out of place to observe that under the present Chief of Coast Artillery the editorial policy indicated for the JOURNAL is the least untrammelled in its history in the latitude allowed for the encouragement of free and open discussion by Coast Artillery officers on every sort of topic related to Coast Artillery activity and progress. It is to be hoped that with the assumption of its new name, THE COAST ARTILLERY JOURNAL may open a new chapter of even wider usefulness to the Corps.

Coast Artillery–Air Service Training

June 6, 1922

Subject: Coast Artillery—Air Service Training.
To: The Editor, Journal of the United States Artillery.

1. It is desired that the enclosed joint recommendation of the Chief of Coast Artillery and the Chief of Air Service be published in the JOURNAL OF THE UNITED STATES ARTILLERY at an early date.

2. The editorial which appeared on pages 462-464 of the JOURNAL for May, 1922, is not in accord with the recommendations referred to above and if allowed to remain uncorrected will probably give an erroneous impression of the object of the proposed joint training exercises.

By order of the Chief of Coast Artillery,

(Sgd.) H. C. BARNES,
Executive Assistant.

Subject: Joint Coast Artillery and Air Service Training.
To: The Adjutant General of the Army.

1. In compliance with the instructions contained in A. G. 353 March 24, 1922 the following comments and recommendations are submitted:

2. Joint training should be conducted at the Coast Artillery Training Center, Fort Monroe, Virginia, and the Air Service Station at Langley Field, Virginia, by a board consisting of 3 Coast Artillery and 3 Air Service officers to be designated by the Chief of Coast Artillery and Chief of Air Service, respectively. Details will be arranged by the board of officers in charge of the work, subject to approval by the Chief of Coast Artillery and Chief of Air Service.

3. The immediate problem consists of the determination of the possibilities and limitations of each of the arms in joint operations in coast defense and the development of training methods which will insure efficient cooperation of the two arms in developing to the maximum their combined defensive power.

4. The following program is proposed:

a. Cooperation of Coast Artillery and Air Service in coast defense.

(1) Conduct of fire.

(*a*) Determination of relative suitability of airships, captive balloons, and airplanes in conduct of fire.

(*b*) Determination of ranges and conditions of which air observation is preferable to ground observation.

(*c*) Experimental work in control of fire at targets beyond the range of vision from shore.

(2) Relative efficiency of aircraft attack and seacoast gun attack on naval targets, within gun range.

(3) Prob lem in joint Coast Artillery—Air Service operations in coast defense.

(*a*) Development of information service.

(*b*) Combined operations against a simulated naval attack.

b. Development of methods of training anti-aircraft artillery.

(1) Target practice at aerial targets, including determination of effect of .50 anticraft machine gun.

(2) Joint training in the use of anti-aircraft searchlights.

5. The above program is limited to joint Coast Artillery and Air Service training as contemplated by A. G. 353 March 24, 1922.

6. The Chief of Air Service will submit separate recommendations for the conduct of exercises to demonstrate the independent mission of the Air Service in coast defense.

7. An appendix is attached showing additional personnel and an estimate of cost for the Air Service part of the program outlined above. No additional Coast Artillery personnel will be required. Estimate of cost of Coast Artillery material will be submitted after report of the board of officers referred to in paragraph 2 above. It appears that this item will be limited to the cost of shipment of ammunition.

(Sgd) M. M. PATRICK,
Chief of Air Service.

(Sgd) F. W. COE,
Chief of Coast Artillery.

The Cover

By reason of the change in name of the JOURNAL, a new cover design became necessary. Our acknowledgment is due to Captain James D. MacMullen, C. A. C. for the conception and execution of the artistic and symbolic design which appears for the first time this month.

At the same time the occasion was ripe for the institution of another change suggested for the convenience of JOURNAL users. Hereafter the Table of Contents will be printed on the front cover, thus facilitating the location of any specific article to which a reader may wish to refer in his file of JOURNALS.

Still another change is in contemplation, which will not affect the appearance, but which should obviate a disadvantage of our time-honored red cover. Many officers have complained that when carrying the JOURNAL to the emplacement or plotting room, if the cover is wetted by rain or sweat, the red comes off in stains on hands and uniforms. In order to overcome this fault, a consistent search and test of all American made red cover papers is being made, to secure an indelible grade.

Through the cooperation of one of the leading paper dealers, it is hoped soon to send out the JOURNAL in a nearly waterproof and indelible cover.

While talking of the cover, it is not out of place to observe that the JOURNAL is not averse to variety and change of cover design. If there are any JOURNAL readers who have ideas for appropriately suggestive cover designs, it is suggested that they embody their ideas in black-and-white sketches, which will be gratefully appreciated, and utilized if mechanically susceptible of reproduction.

The Prize Essay Competition

An experiment was made to attempt the modification of the JOURNAL'S traditional Essay Competition, through the institution of two competitions, one ending in June, and the other in December. Two purposes were in mind, first to avoid the previously unavoidable delay in presenting the ideas of competitors to the Coast Artillery world and second, to direct the discussion of a portion of our contributors toward the solution of a seemingly timely and important problem.

The experiment failed, as not a single essay was received for the first competition announced for this year. Recognizing that the Coast Artillery did not approve the attempted innovation, the conditions have again been changed so as to revert to established custom, and the annual allotment for prizes has been divided between two prizes to be awarded at the end of December, in accordance with the detailed announcement which appears on the inside front cover.

COAST ARTILLERY BOARD NOTES

Work of Board During Current Month

THE Board was principally engaged during the current month in writing Training Regulations. Twelve separate pamphlets are to be issued under this head, of which the following have been completed by the Board, but have not yet been approved by higher authority:

1. The Fire Command.
2. The Mine Command.
3. The Fort Command.
4. Emplacement and Tactical Employment of Artillery.
5. Schloming Film Scale.

The following pamphlets are approaching completion:

1. The Battery Command.
2. The Coast Defense Command.
3. Definitions.
4. Meteorological Service.

The following pamphlets in the series have been ordered written, but no work was performed on them during the current month:

1. Service of the Piece.
2. Minimum Specifications for Coast Artillery Troops.
3. Gunnery.

The test of Beaveralls was completed during the month and their use approved after certain minor changes for enlisted men engaged in care of motor transport.

The Cristobal Fire Control Project and test of Wilson Target Computer were transferred from the Coast Artillery Board to the Coast Defenses of Cristobal by direction of the Chief of Coast Artillery.

The French tangent reticule instruments for high burst ranging were tested during the month by the Battery Commander's Class, but no definite decision has been reached in regard to their use.

Parts IV, V and VI of the handbook of Coast Artillery Matériel have been completed and approved. These are now in press and will in all probability be availble for issue by July 30th.

The book of Gunnery Problems was completed and is now undergoing some minor corrections. It will be forwarded in the immediate future for approval of the Chief of Coast Artillery.

The Board considered the Bowler Spotting Board and found sufficient merit in the device to warrant test. This project is now suspended awaiting arrival of Spotting Board for test.

The Board considered the Scheerer Plotting Board for use with balloon base lines and decided to suspend this project pending further tests in competition with terrestrial boards to be conducted at current target practice in Coast Defenses of Puget Sound.

The Board considered certain suggestions of Captain Blackwell for the improvement of methods of aiming and laying on moving targets. It was decided

that the suggestions did not possess sufficient advantage over the existing method to warrant the increased cost.

The Board undertook some experiments in reference to application of duplex radio telephoning to Coast Defense service. The results of the test obtained to date are promising. Members of the Board have been able to communicate over post system (automatic) with the harbor boats in the bay.

The Board has received samples of the modified Galitska panel. These are a clocklike arrangement of white on an orange ground or orange on a white ground, for use of communication between ground and Air Service. Experiments have been undertaken in conjunction with the Air Service to determine the efficiency of the panel.

There is to be undertaken in the near future a test of mortar subcaliber ammunition with loaded and fuzed shell. Preliminary tests by Ordnance Department indicate that shell will burst on impact with the water. It is hoped that this ammunition will fill a long-felt need among the personnel of the mortar units.

Two T. I. Bells were received during the month and these have been installed in local fire control systems for comparative tests.

Besides the foregoing, the Board has a number of projects which are inactive during the month, pending arrival of instruments, etc. The usual charts, range tables, etc., were furnished throughout the month.

Target Computers Under Test

Recently two new target computers have been undergoing tests. Each is a radical departure from previous attempts to solve this problem. In following through the description and in studying the photographs, one must remember that these are still in the experimental stage. Exhaustive tests are arranged and will without doubt result in changes. The reader must not get the impression that these instruments in their present forms will be issued for general use. Rather, this description is to inform the service generally as to experimental developments along these lines.

In the design of each of these computers, the following requirements were considered: plotting through 360°; ready change of observing stations; the measurement of all ranges up to 40,000 yards with a low limiting error.

The idea of using a ray of light instead of a material arm on a plotting board was proposed several years ago by Major F. E. Wright, Ordnance Department while he was assigned to the Fire Control Design Section of the Artillery Division in the Office of the Chief of Ordnance. The idea was worked up by Major Wright and Major H. K. Rutherford, O. D., and embodied in the original Optical Plotting Board. The Coincidence Target Computer is a development of this idea, although so many modifications have been made that the relationship is hardly recognizable. The design of the Coincidence Target Computer in its present form is the result of the collaboration of Major Quinn Gray, C. A. C. and Dr. I. C. Gardner, who was formerly employed by the Fire Control Design Section at Frankford Arsenal. The original design proposed by Major Gray was found somewhat impracticable but as a result of certain suggestions made by Dr. Gardner in a conference, the basis of the final design was worked out in a practicable form.

The basic idea of the Wilson Target Computer is entirely Major Wilson's. He furnished the Arsenal with study sketches of the device and the Fire Control Design Section at the Arsenal worked them up in close cooperation with Major Wilson.

A large portion of the credit for the accuracy of these instruments should be given the Instrument Department at Frankford Arsenal, Major F. A. Englehart, O. D., in charge, for the excellent workmanship in their construction.

Coincidence Target Computer
Model E

The Coincidence Target Computer, Model E, is a device for ascertaining the range and azimuth of a target from a fixed directing point using the common bilateral triangulation method. It differs radically from all previous plotting boards and target computers constructed and in order that the underlying principles upon which it is based may be clearly understood, it will be necessary to refer to the principle upon which the usual plotting board is constructed and to show the various steps by which the principle used in the construction of the computer has been evolved.

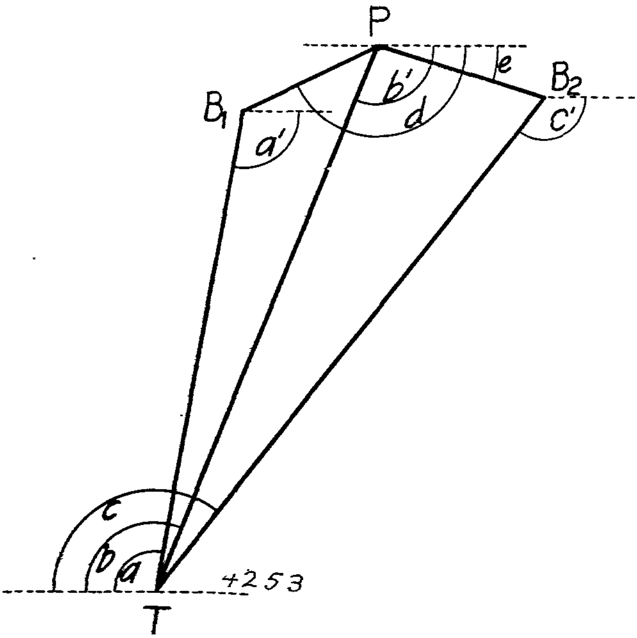


FIGURE 1.

Figure 1 shows the fundamental triangles that are reproduced on the present type plotting boards. T is the target, B_1 and B_2 are the base end stations and P the directing or reference point or gun center.

The dotted lines at the triangle vertex represent the meridian or datum line from which all angles are measured. In use, the lengths B_1P and B_2P are laid off from P, making angles d and e respectively with the meridian. B_1 and B_2 are then correctly located with reference to P and represent the two base end stations. At B_1 and B_2, angles a′ and c′ are laid off in accordance with readings taken by the observers at the two stations. The intersection of the two station arms at T determines the location of the target. PT is the range and b′ is the azimuth. Boards substantially of this type are in use and have proved fairly satisfactory for the moderate ranges in use up to the present time. However, the tendency at present is toward the development of plotting boards capable of computing ranges from 5000 to 40,000 or 60,000 yards. Using a scale of 200, 400 or even 600 yards to the inch, the increased ranges would require a board of huge size with

arms ranging from 16 to 25 feet long, which would be too unwieldy for practical use. If the scale of such a board is made smaller, say 2000 yards to the inch, mechanical interferences are very likely to develop between points B_1, P and B_2, as in numerous cases these distances are small (less than 3000 yards). For these reasons, a more compact type of range computer than the plotting board has become necessary.

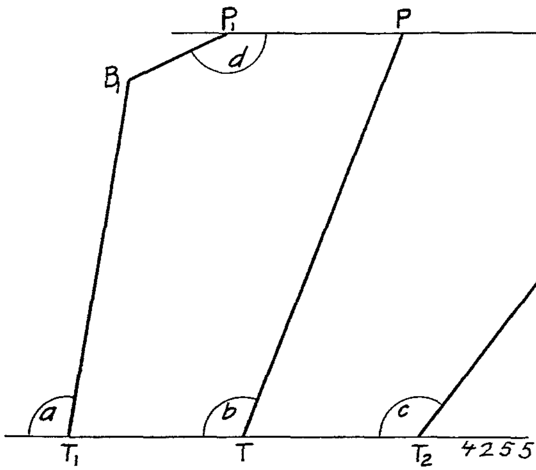


FIGURE 2.

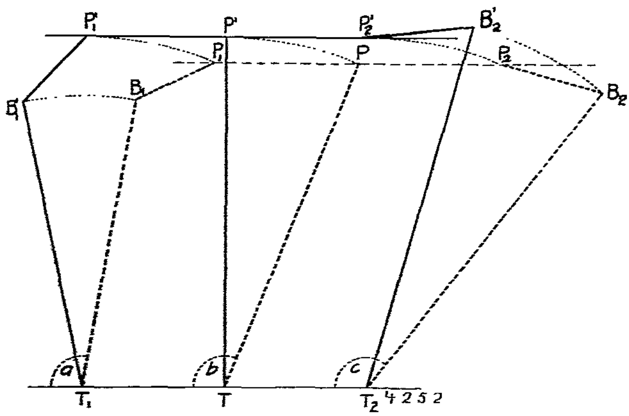


FIGURE 3.

In constructing the present computer, the quadrilateral figure TB_1PB_2 of Figure 1 has been split into three elements by dividing it along the line PT. These elements are then separated laterally, as shown in Figure 2, so that sufficient room is left at the points P_1,P and P_2 and T_1, T and T_2 of Figure 2 to permit the employment of the desired arrangements without mechanical interference. It will be noted that the separation of the quadrilateral into its components has been made without alteration of any angles or the change in distance between any of the stations, or the range to the target.

To simplify the mechanical construction of the board, a further change in the relation of the basic triangles of Figure 1 was made, as shown in Figure 3. The heavy dotted lines T_1B_1, etc., are in the same relationship to each other and to the meridian as in Figure 2, but the full lines T_1B_1' etc. show the relationship of the parts when they have been rotated about the points T_1, T and T_2 respectively through such an angle as will make TP' of Figure 3 and consequently T_1P_1' and T_2P_2' perpendicular to the line T_1TT_2. The angles of rotation of the elements of the basic triangle are all equal, hence it is evident that the points P_1', P' and P_2' all lie in the same straight line as in Figure 2. The effect of this rotation of the elements of the basic figure is only to change the azimuth, b, of the target.

The present computer is based on the diagram as shown in Figure 3. Mechanical means, as described below, are provided for measuring in yards the length of

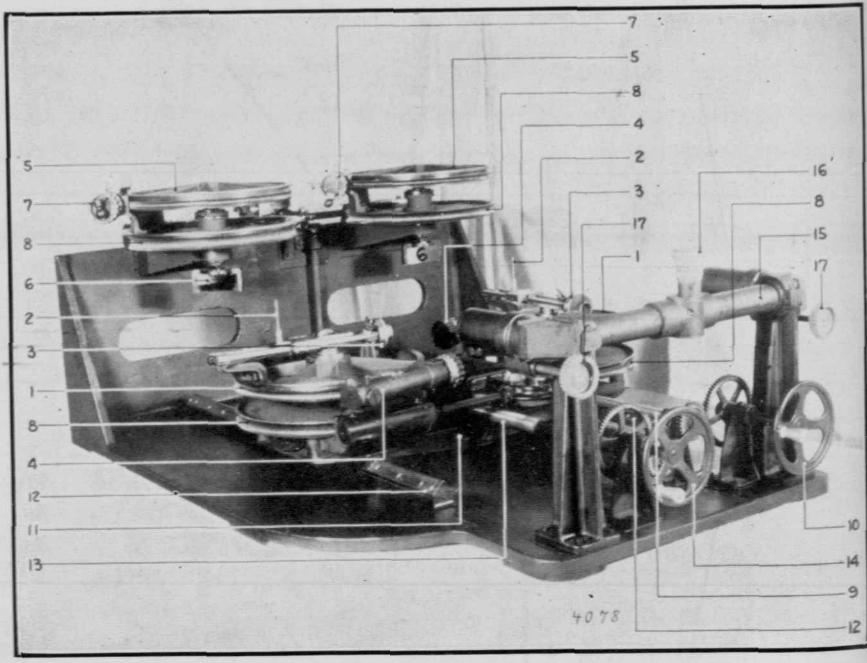


FIGURE 4. COINCIDENCE TARGET COMPUTER, MODEL E

the line $P'T$, which represents the range and its angular position with respect to the meridian which, of course, gives its azimuth.

Refer now to Figures 4 and 5, showing the assembled board. The points P_1' and P_2' of Figure 3 are represented on the board by the centers of the azimuth circles *1, 1*. The base end stations B_1' and B_2^2 are represented on the board by the pins *2,2*, which, by means of the screws *3,3*, and azimuth worms *4,4*, may be set at the required displacement of the base ends from the directing point.

At *5,5* are shown two graduated azimuth circles, the centers of which represent the points T_1 and T_2 respectively of Figure 3. These azimuth circles are rigidly secured to spindles which pass through the worm wheels shown below them and carry at their lower ends the two mirrors *6, 6*, which are thus constrained to rotate with the azimuth circles *5, 5*. The azimuths of the target from the two base end stations are set on the respective circles *5, 5* by the azimuth worms *7, 7*.

Each of the four azimuth circles *1, 1* and *5, 5* are supported by wormwheels *8* whose axes of rotation are the same as those of the corresponding azimuth circles. The worms which operate each of the azimuth circles are secured to the corresponding worm wheel *8*, so that when the latter is rotated by means of its worm, the corresponding azimuth circle with its worm and index is also rotated without changing the reading indicated by the azimuth circle. All four of the worm wheels *8* are connected through worms, shafts and gears to a common shaft *9* operated by the handwheel *10*, so that all rotate in common when the handwheel is turned by the operator.

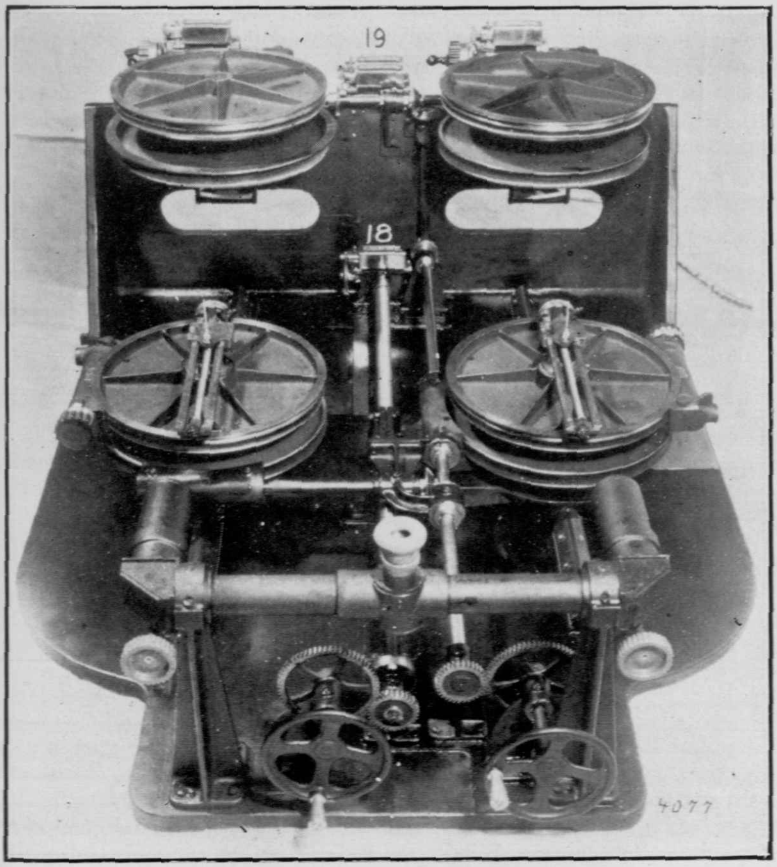


FIGURE 5. COINCIDENCE TARGET COMPUTER, MODEL E

The two worm wheels *8* which support the azimuth circles *1, 1,* are supported on a carriage *11*, which is arranged to slide on the board along the rails *12, 12*, under the action of the screw *13*, which is controlled by the operator through the handwheel *14*.

A telescope *15* is mounted at one end of the board at the same height above the board as the mirrors *6,6*. This telescope consists of two separate optical systems, one of which observes images in one mirror and the other in the other mirror, combining the results in a single eyepiece through which the operator ob-

serves when using the computer. The field of view of this eyepiece presents the appearance of a coincidence type self-contained range finder, namely, that the field is divided into halves by a horizontal halving line. In the upper half is seen the image of the pin *2* as seen reflected from one of the mirrors *6*, and in the lower half that from the other mirror. Separate focussing knobs, *17, 17* are provided for each of the objectives of the telescope, so that each pin may be brought independently into accurate focus in the eyepiece *16*.

As stated above, the points T_1 and T_2 of Figure 3 are represented on the board by the centers of rotation of the mirrors *6,6;* the points P_1' and P_2' by the centers of rotation of the worm wheels *8,8;* and the points B_1' and B_2' by the pins *2,2.* The telescope is located at a convenient position in rear of the line $P_1'P_2'$ and is so arranged that the line of collimation of the two optical systems passes through the points $P_1'T_1$ and $P_2'T_2$ respectively. These lines, by the construction of the board, are fixed and invariable, even though the distance between the line $P_1'P_2'$ and T_1T_2 be altered by translation of the carriage *11*, or the mirrors *6,6* be rotated, or the relation of B_1' and B_2' with reference to P_1' and P_2' respectively be changed.

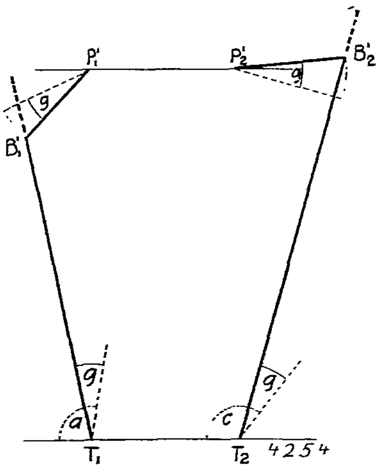


FIGURE 6.

The operation of the computer is then as follows:

The points B_1 and B_2 are first set in the proper location with reference to P_1 and P_2 respectively from the given data. The mirrors at T_1 and T_2 are set at the azimuths of the target as observed from B_1 and B_2 respectively, which has the effect of reflecting the images of B_1 and B_2 along the lines T_1P_1 and T_2P_2 respectively. The triangles so formed, viz., $B_1T_1P_1$ and $B_2T_2P_2$ are then, in effect, rotated as a whole about the points T_1 and T_2 respectively carrying the mirrors with them until the lines T_1P_1 and T_2P_2 take the positions T_1P_1' and T_2P_2' perpendicular to T_1T_2, or in other words, until the images of the pins B_1' and B_2' are in the line of collimation of the telescope. Before this condition can be obtained, it is evident that the points P_1' and P_2' must be placed at the proper distance from T_1 and T_2 which, of course, is accomplished by translating the carriage *11* along the rails. Since the coincidence of the images of the two pins in the telescope, which serves as an indication of the correctness of the setting of the computer, is dependent both on the setting of the distance P_1T_1 and on the rotating of the triangles to their proper positions, these adjustments must be made simultaneously by means of the two handwheels *14* and *10*.

When this coincidence is obtained, it is evident that the distance P′T is proportional to the required range and the amount of rotation required of the line T_1P_1, for example, to bring it to the position T_1P_1' serves as a measure of the azimuth, b, of the target. By using suitable recording mechanisms in conjunction with the carriage *11* and actuating screw *13*, the computer is caused to indicate range on the indicator *18*. Similar recording devices operating in conjunction with the worm wheels *8* indicate azimuths of the target directly at *19*.

The impression has been given above that the computer rotates the triangle $B_1T_1P_1$, for example, to its correct position $B_1'T_1P_1'$, as a separate rigid unit. While the effect is the same as if this were done, the actual operation consists in rotating the line P_1B_1 separately from the other two sides of the triangle until the triangle is exactly reproduced in its rotated position,which condition is indicated by the appearance of the image of the pin B_1' in the eyepiece of the telescope. This is shown clearly in Figure 6, where g shows the angle through which the worm wheels 8 are rotated. The full lines, therefore, of Figure 6 show the relative positions of the elements of the basic quadrilateral shown in Figure 1, as developed by the computer when coincidence of the two pins is obtained in the eyepiece of the telescope.

The computer is constructed to a scale of 2000 yards to the inch. The pins representing the stations can be located a maximum distance of 7.5 inches or 15,000 yards from the reference point and at any desired azimuth. The carriage supporting the station mechanism can be translated 21 inches from the reflecting mirror axis corresponding to a range of 42,000 yards.

Target Computer Model E (Wilson)

The Target Computer Model E (Wilson) is a device for ascertaining the range and azimuth of a target from a fixed directing point. These are obtained by methods similar to those of the present types of plotting boards.

The base end stations are movable and each can be located by rectangular coordinates to a distance of 20,000 yards either front, rear, right or left of the directing point. The scale of the computer is 5,000 yards to the inch and the maximum range that can be measured is 41,000 yards.

The principal parts are the frame consisting of the upper, intermediate and lower transoms between the vertical end posts, the upper and lower azimuth mechanisms (corresponding to base end stations), the range arm and its azimuth circle, and the range indicator or intersection locator.

Figures 7 and 8 are views of this instrument. The base end station assemblies are constructed on the same principles, thus the lower assembly only will be described. Both assemblies have been similarly numbered. The upper portion of the circular casting *1* is machined to carry the cross head *2*. Part *3* is similar to *2* and supports the azimuth mechanism *4* which in turn supports the arm *5* which corresponds to the station arm on the usual type of plotting board. From the construction of the parts *1*, *2* and *3*, it will be noted that the rotation of the screws *6* will cause the translation of *2* and that the rotation of the screw *7* causes the translation of the part *3*, thus affording means for locating the station by its rectangular coordinates. In the construction of the computer, the vertical axes of the spindles of the casting *1* and of the azimuth mechanism *4* are on the center line passing through the upper plate, upper azimuth mechanism and the range arm center or directing point on the intermediate transom. When these spindles are centered in this position, the scales *30* and *31* and the micrometers *32* and *33* attached to the screws *6* and *7* should indicate zero.

The lower edge *10* of part *1* has thirty-six notches equally spaced. The stop *11* actuated by the lever *12* serves the purpose of definitely locating the mechanism.

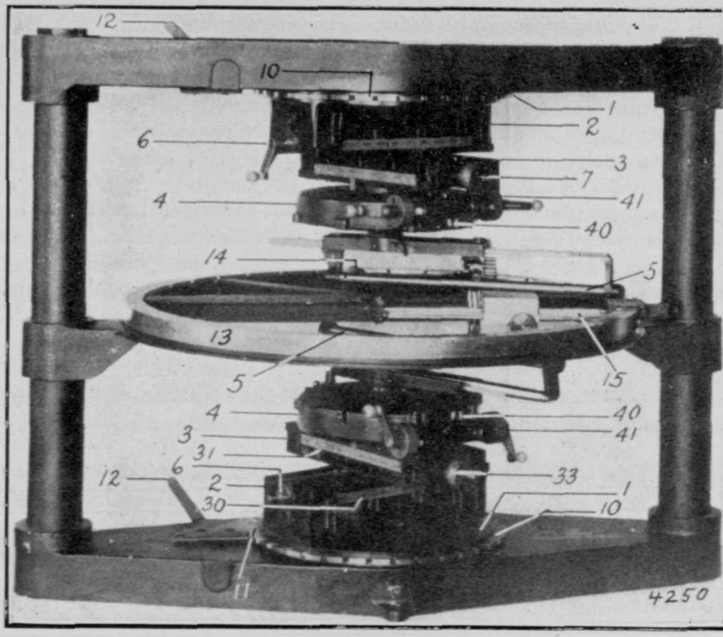


FIGURE 7. TARGET COMPUTER, MODEL E. WILSON

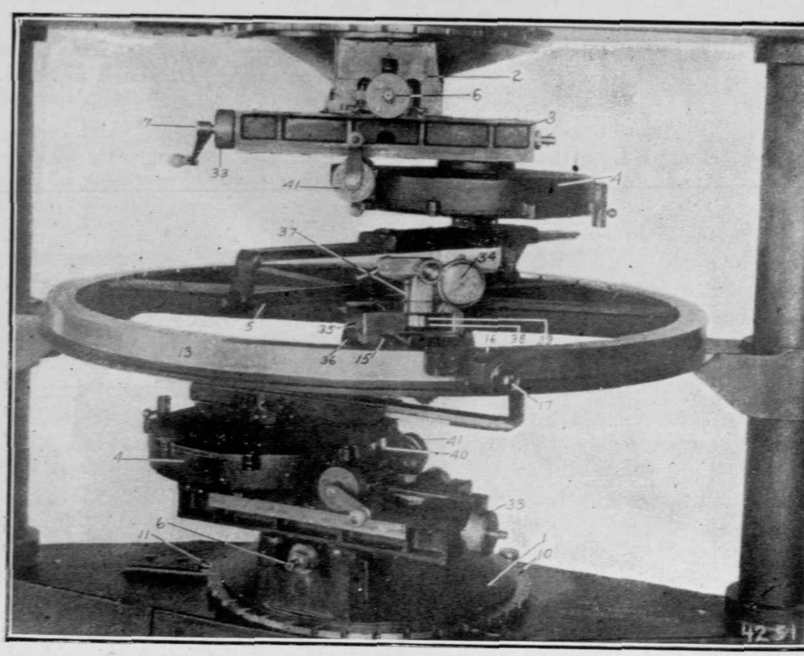


FIGURE 8 TARGET COMPUTER, MODEL E (WILSON)

The notches are numbered from 0 to 36 clockwise. These serve the purpose of locating the normal to the base line within ten degrees of the normal line of the computer and should be used for reference purposes only. They are not intended to register movements corresponding to true azimuth.

The intermediate transom supports the main azimuth circle *13* and the range arm *15* with the intersection indicator *34* mounted thereon. The main azimuth circle *13* is also notched and numbered similarly to the circle *10*. The vertical outside edge is graduated in degrees, numbered every degree. The spring plunger *14* serves the same purpose as the stop *11* previously referred to. The range arm *15* supports the intersection indicator *34*. Upon the end of the arm is mounted the azimuth vernier *16*. The graduations of this vernier are fine and a magnifying glass *17* is provided for ease in reading. Intersection is obtained by sliding the indicator assembly *35* along range arm *15* by the knobs *36*. When nearing intersection the ends of the cylindrical balanced rod *37* bear against the station arms *5,5*. The assembly *35* is moved along the range arm *15* until the Ames indicator *34* gives a reading of zero. The range to the target is then read from the range arm and the drum verniers *38* and *39*. Ranges may be read to 10 yards.

To operate, set the azimuth mechanisms *4,4* to the positions of the base end stations by setting off the coordinates of these stations from the directing point on the scales *30* and *31* using the screws *6,6* and *7,7*, reading hundreds and tens of yards on the micrometers *32* and *33*. Set circles *10, 10* and *13* by the stops *11, 11* and *14* so that all engage in the notches numbered to correspond to the nearest ten degrees to the normal to the base line. Set the azimuths as read from the base end stations on the plates *40, 40* and the micrometers *41, 41*. Obtain an intersection with the indicator assembly *35* and the indicator *34*. When this is accomplished the range and azimuth of the target may be read directly as previously described.

Course in Employment of Heavy Artillery

EVER since the Beaten Zone Department of the JOURNAL was started in March 1920, it has been contemplated to include a course in the Employment of Heavy Artillery in the Field. At last, through the cordial cooperation of Colonel Richmond P. Davis, the Commandant of the Coast Artillery School, and the Director and Instructors of the Department of Military Art, Coast Artillery School, it has been possible to produce a coordinated series of problems for this course.

The purpose of this course is distinctly different from any other treatment of instruction in Heavy Artillery tactics and operations which has hitherto been given in any Service School. All the work in the employment of artillery other than divisional artillery as given at the General Service Schools envisages the problem from the standpoint of the high command or of the Staff. Officers are trained to know the possibilities and limitations of railway artillery and heavy tractor artillery so that they may know how much reasonably to require of this class of artillery. But hitherto there has been nowhere available either any concise text or compilation to guide battalion and battery commanders as to the proper practice in handling the many small details whose proper performance constitutes the only guarantee of success in handling these types of artillery, nor are there elsewhere any tactical problems available to bring out needed lessons in the employment of these types of artillery from the standpoint of the battery and battalion commanders. So it should be understood that the course which is now being inaugurated in the Beaten Zone is intended solely to be of assistance to battalion and battery commanders in helping them to formulate definite conceptions as to the detailed performance of the duties to be required of them when their organizations are assigned, either as Corps or Army Artillery, in the field.

A total of twelve problems has been prepared, to be published one each month in the JOURNAL beginning with the current issue. In the issue following the one in which each problem appears will be published a complete solution. These problems have been given to the Basic and Battery Officers' Classes in the Coast Artillery School during the spring of 1922, and both problems and solutions as presented in the JOURNAL attempt to represent the concensus of opinion of both the instructors and students who have worked with the problems. The problems are arranged in pairs, all odd numbered problems carrying a battalion of 8-inch Howitzers through a successive series of special situations based on an original general situation which is modified to carry out a logical series of events, while

the even numbered problems parallel as far as practicable the same sort of special situations with a battalion of 12-inch Railway Mortars.

In general, Problems Numbers 1 and 2 cover the entraining and movement of a battalion from its concentration position to the theatre of operations, with its detraining and marching to a position in readiness. Problems Numbers' 3 and 4 cover the occupation by the battalion of a position in a stabilized sector, including details of battalion and battery supply, administration, motor and gun repair, evacuation of wounded, traffic control, and so forth. Problems 5 and 6 cover the employment of a battalion in support of a defensive action. Problems 7 and 8 cover the preparation for the execution by battalion of a mission in an attack of limited objectives and the reconnaissance for a move forward. Problems 9 and 10 cover the participation of a battalion in the execution of an attack with unlimited objective. Problems Numbers 11 and 12 cover the withdrawal of a battalion in retreat. It is hoped that this method of paralleling similar situations for tractor and railway artillery will serve to emphasize the elements of similarity and the points of difference in the handling of the two types of artillery.

The JOURNAL has obtained from the General Service Schools a supply of one inch Gettysburg Maps, with quadrillage super-imposed, one of which is being included as a supplement to the JOURNAL for each domestic subscriber. While this map is on a scale too small for satisfactory use in the solution of these problems, yet it may be used in case the subscriber does not possess and does not care to purchase the necessary sheets of the 3-inch Gettysburg Maps, and in any event will be found convenient in laying out the situation as regards opposing fronts, gun positions, and objectives. It is earnestly recommended that the student provide himself with the necessary sheets of the 3-inch Gettysburg Maps which may be obtained from the JOURNAL at $0.06 each, postpaid. The following sheets will be required: Emmitsburg, Gettysburg, Hunterstown, New Oxford, Bonneauville, Knoxlyn, and Arendtsville. The student should use the Field Service Regulations and Combat Orders which can be supplied at $0.75 and $0.45 respectively, postpaid by the JOURNAL. All other necessary reference material will be furnished with each problem in the form of notes, data sheets, sketches, and tables of organization.

Finally it may be said that it has been somewhat difficult to visualize the actual needs of widely separated officers in undertaking the study of a series of problems of this kind, so that while an effort has been made to present the problems and the necessary preliminary data in sufficient detail to enable the individual student to pursue their study with profit, yet individual subscribers may encounter difficulties which were not foreseen and provided for. Consequently, it is urged that each officer working the early problems send in such suggestions as occur to him as to the improvement of the problems, either as to content or as to method of presentation. On the basis of such suggestions it may well be that the later problems in the course may be substantially improved before publication.

Employment of Heavy Artillery—Problem No. 1

Map: Gettysburg 1-inch reduced from 12-inch or Gettysburg 3-inch, Bonneauville Sheet.

General Situation:

The Blue Ridge Mountains and the Maryland-Pennsylvania line eastward form the boundary line between two hostile states. Reds are to the west and north. Blues are to the east and south.

War was declared February 15, 1922, and Blues immediately crossed over into Red territory in vicinity of Gettysburg.

Since 15 March the 1st and 2nd Blue Armies have been in contact with the enemy along the general line: (338.0–738.0)–Fairplay–Willow Grove S H–White Run–Granite Hill–Hunterstown–Newchester–(364.0–765.5). Both sides have been improving their lines.

Special Situation (Blue):

The 1st Bn 701st Art (8-inch Howitzer, tractor drawn, CAC troops) with its section of the Service Battery is at Camp Eustis, Va.

At 9:00 AM 23 March the CO Camp Eustis received telegraphic instructions attaching the 1st Bn 701st Art to the 1st Army and directing it to proceed at once by rail to Littlestown where further orders would be received.

The Camp Commander after consulting with the CO 1st Bn notified the railroad official as to the amount and kind of transportation required and was later informed that the train would be spotted at the Camp at 1:00 PM 24 March. Approximate length of journey expected is 24 hours. The Camp Utilities has been instructed to issue materials for loading, including floor plates and three end ramps. Railway trackage at Camp Eustis is shown on map herewith.

1st Requirement:

Assume that the necessary transportation is furnished as determined by you as Battalion Plans and Training Officer, using data sheet herewith as a basis. Show composition of train from head to rear, with loadings of each car, (including personnel). In case you divide your train into sections, show organizations assigned to each section.

N.B. A battalion acting alone has attached to it its section of the Service Battery. Assume also its proportion of attached Regimental medical troops as follows:

1-Capt.	1-Ambulance, motor
1-Sgt.	1-Motorcycle
1-Corp.	1-Truck, ¾ ton.
7-Pvts.	

2nd Requirement:

Give the Battalion Commander's written order for entraining.

3d Requirement:

Your battalion arrives at Littlestown at 6:40 PM 25 March and is met by a representative of G-3 1st Army with orders attaching the battalion to the 3d Corps. The orders direct it to detrain in the vicinity of Bashore Mill and to march via–RJ 612–CR 633–RJ 610 to woods at (363.2–744.4). The orders allow the use of above road including the road south from Bashore Mill and the branch road just north of Bashore Mill from R.R. Crossing via Washington Meeting House to CR 566, by the battalion between the hours of 7:30 PM and 3:30 AM and direct that all elements of the command be under cover by 4:50 AM 26 March. (The Littlestown–Hanover Electric R R is standard gauge single track and connects with the Northern Central at Littlestown).

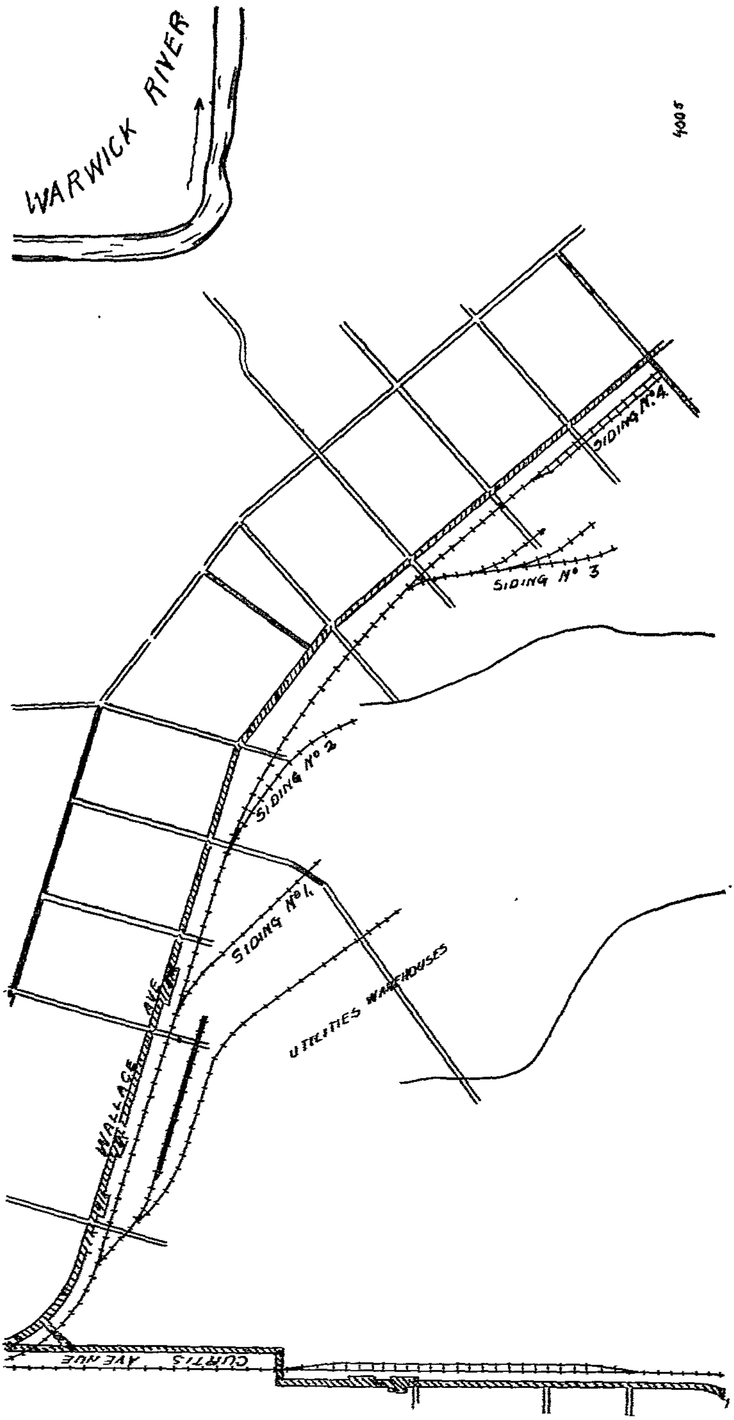
Where would you spot the train for unloading?

State briefly Major A's procedure in detraining, including an estimate of time required.

4th Requirement:

(a) List by vehicles and sections the light (motor) and heavy (tractor) columns of this battalion for a march (without reference to the particular situation in this problem).

(b) Sketch to convenient scale, showing by sections, both light and heavy columns with road spaces on the march in daytime.



RAILROAD TRACKAGE, CAMP EUSTIS, VA.
SCALE: APPROX. 1-IN. = 830 FEET

On account of the different speeds of the ordinary motor vehicles and the heavy tractors pertaining to units of heavy motorized artillery, it has been found necessary on the march to move them separately forming what is termed "light" and "heavy" columns. Average speeds are as follows:

Tractors, 3½ miles per hour.

Other motor vehicles, 8-10 miles per hour.

Ordinarily an officer is put in charge of each column. Experience has also shown it advisable for convenience and control to further divide each column into sections, of approximately 10 vehicles per section, an officer or noncommissioned officer being placed in charge of each. The interval between sections should be about 50 yds., with this exception, that conditions at night may sometimes render it necessary to reduce the interval.

While the majority of the personnel usually travels with the light column, convenience in messing arrangements may require the heavy column to carry a water trailer and a kitchen trailer. If necessary, rations and additional supplies are carried in trucks, in which case the trucks are drawn by tractors. This column may also include motorcycles for the use of the men in charge of the sections.

Data Sheet

(For use in Problems 1 and 2)

Reference T of O, 145W, 147W, 148W, 742W, 746W.

Material	Length over all	Number can be carried on flat car	Unit road space in yds. (incl. intervals) in day time	Remarks
Ambulances, motor	17ft 0in	2	27	
Cars, motor, 5 pass	13ft 4in	3	27	Flats are 40 ft. x
Cars, reconnaissance	17ft 0in	2	27	8 ft. Gondolas are
Motorcycles, sidecar‡	5ft 5in	9	20	40 ft. long. Box
Tractors, 2½ or 5-ton	9ft 4in	4	25	cars are to be used
Tractors, 10-ton	13ft 6in	2	25	for personnel at
Trailers, A.A.M.G.	15ft	2	5	not to exceed 25
Trailers, kitchen	15ft	2	5	men per car.
Trailers, radio 1½ ton	18ft	2	5	
Trailers, water (180 gal)	12ft	3	5	Unit road spaces
Trucks, FWD, Art. Sup.	17ft 0in	2	27	herein given would
Trucks, cargo, ¾ Ton	17ft 0in	2	27	have to be reduced
Trucks, cargo, F.W.D.	17ft 0in	2	27	at night to avoid
Trucks, light repair	14ft 0in	2	27	losing contact.
Trucks, tank (750 gal)	17ft 0in	2	27	
Howitzers	22ft *	1	50†	
Limber	8ft *			XX
Platform	21ft *			
Gun, platform and limber	48ft *			

* Space occupied ordinarily. It is possible, however, to place a gun, limber, platform and 10-ton tractor on one car.

† 50 yards for 1 tractor (10-ton) with gun, limber and platform.

‡ Allow 4 ft. 3 in. width in placing motorcycles side by side across the car.

Table 145 W.—SERVICE BATTERY, ARTILLERY REGIMENT.

6-inch Guns, 155-mm. Guns, 8-inch Howitzers, 9.2-inch Howitzers, and 240-mm. Howitzers (Motorized).

(War Strength.)

Road Space...... ——— Yards

Tonnage......... ———Tons

April 26, 1921.

	1	2	3	4	5	6	7	8	9
1	UNITS	Specialist Rating (Class)	Symbol Number	Regimental Section	Band Section	1st Battalion Section	2nd Battalion Section	3rd Battalion Section	Total
2	Captains			1 (a)					1
3	First lieutenants			1		1 (b)	1(b)	1 (b)	4
4	Second lieutenants					1	1	1	3
5	Total Commissioned			2		2	2	2	8
6	Warrant officers				1 (c)				1
7	Master sergeants, incl.			1		1	1	1	4
8	Sergeants major			(1)(d)					
9	Supply					(1)	(1)	(1)	
10	First sergeants			1					1
11	Staff sergeants, incl.			1	1				2
12	Assistant band leader				(1)				
13	Motor			(1)					
14	Sergeants, incl.			4	3				7
15	Band				(3)				
16	Clerk			(1)(d)					
17	Mess			(1)					
18	Supply			(1)					
19	Transportation			(1)					
20	Corporals, incl.			4	4	1	1	1	11
21	Agent			(1)					
22	Band				(4)				
23	Clerks			(2)(1d)					
24	Supply			(1)		(1)	(1)	(1)	
25	Privates, 1st class and privates, incl.			32	40	18	18	18	126 (e)
26	Chauffeurs	5th		(6)		(3)	(3)	(3)	
27	Chauffeurs	6th		(5)		(2)	(2)	(2)	
28	Clerks, personnel	4th		(1)					
29	Cobblers	5th				(1)	(1)	(1)	
30	Cooks (Assistant)	5th		(2)					
31	Cooks (First)	4th		(2)					
32	Drivers, tractor	5th		(1)					
33	Mechanics, chief	4th		(1)					
34	Mechanics, motor	3th				(1)	(1)	(1)	
35	Mechanics	6th		(1)					
36	Motorcyclists	6th		(3)		(2)	(2)	(2)	
37	Musicians	2nd			(4)				
38	Musicians	3rd			(6)				
39	Musicians	4th			(6)				
40	Musicians	5th			(15)				
41	Musicians (not rated)				(9)				
42	Miscellaneous (not rated)			(10)		(9)	(9)	(9)	
43	Total Enlisted			43	48	20	22	20	151
44	Aggregate			45	49	22	22	22	160
	EQUIPMENT COMMON TO ALL TYPES OF ARMAMENT								
45	Cars, motor, 5 passenger			1					1
46	Motorcycles, with side cars			3		2	2	2	9
47	Tractors, 2-1/2 or 5 ton			1					1
48	Trailers, kitchen			1					1
49	Trailers, ramp			1					1
50	Trailers, water, (180 gal.)			1					1
51	Trucks, (F.W.D.) artillery supply, Load C			1					1
52	Trucks, cargo, 3/4 ton			1					1
53	Trucks, cargo, (F.W.D.)			3	3	5	5	5	21
54	Trucks, light repair			1					1
55	Trucks, tank, (750 gal.)			1					1
56	Pistols			45	49	22	22	22	160
57	Rifles, automatic			2		2	2	2	8
	ADDITIONAL EQUIPMENT FOR 8-INCH HOWITZERS								
58	Trucks, cargo, (F.W.D.)								4
	ADDITIONAL EQUIPMENT FOR 9.2-INCH AND 240 m.m. HOWITZERS								
59	Trailers, ramp								5
60	Trucks, cargo, (F.W.D.)								4

10 — Remarks

(a) Regimental supply officer.

(b) Battalion supply officer.

(c) Band leader.

(d) Personnel records.

(e) Includes:
41 privates 1st class
85 privates

Summary of Specialist Ratings:

2nd Class ---- 4
3rd Class ---- 6
4th Class ---- 10
5th Class ---- 39
6th Class ---- 21 (25 for howitzers)
Total 80 (84 for howitzers)

Table 147 W.—HEADQUARTERS AND HEADQUARTERS DETACHMENT, ARTILLERY BATTALION.

6-inch Guns, 155-mm. Guns, 8-inch Howitzers, 9.2-inch Howitzers, and 240-mm. Howitzers (Motorized). (War Strength.)

Road Space...... ——Yards
Tonnage.......... ——Tons

April 26, 1921.

	1	2	3	4	5	6	7
1	UNITS	Specialist Rating (Class)	Symbol Number	Battalion Headquarters	Headquarters Battery	Total	Remarks
2	Majors			1		1	
3	Captains			1(b)		1	
4	First lieutenants			3(a)	1 (a)	4	
5	Second lieutenants			2(a)		2	
6	Total Commissioned			7	1	8	
7	First sergeants				1	1	
8	Staff sergeants, incl.				2	2	
9	Master gunners				(1)		
10	Sergeants major				(1)		
11	Sergeants, incl.				5	5	
12	Agents				(1)		
13	Chiefs of Battalion Scouts				(1)		
14	Communication				(1)		
15	Mess				(1)		
16	Supply				(1)		
17	Corporals, incl.				11	11	
18	Clerk				(1)		
19	Communication				(2)		
20	Observer				(2)		
21	Postal				(1)		
22	Radio				(1)		
23	Scout				(3)		
24	Miscellaneous				(1)		
25	Privates, 1st class and privates, incl				47	47 (c)	
26	Chauffeurs	5th			(4)		
27	Chauffeurs	6th			(4)		
28	Cooks (Assistant)	5th			(1)		
29	Cooks (First)	4th			(2)(d)		
30	Drivers, tractor	5th			(1)		
31	Mechanics, chief	4th			(1)		
32	Mechanics, motor	5th			(1)		
33	Motorcyclists	6th			(5)		
34	Operators, radio	6th			(2)		
35	Miscellaneous (not rated)				(26)		
36	Total Enlisted				66	66	
37	Aggregate			7	67	74	
38	Cars, motor, 5 passenger				2	2	
39	Cars, reconnaissance				1	1	
40	Motorcycles, with side cars				5	5	
41	Tractors, 2-1/2 or 5 ton				1	1	
42	Trailers, kitchen				1	1	
43	Trailers, radio, 1-1/2 ton				1	1	
44	Trailers, water, (150 gal.)				1	1	
45	Trucks, cargo, 3/4 ton				1	1	
46	Trucks, cargo, (F.W.D.)				4	4	
47	Pistols			7	67	74	
48	Rifles, automatic				2	2	

Remarks:

(a) Battalion Staff consists of:
- Adjutant
- Intelligence Officer
- Plans and Training Officer
- Communications Officer
- Orienteur Officer
- Supply
- Liaison Officer

The Supply Officer commands the battalion section of the Service Battery and is included in the totals of the Service Battery.

(b) Executive

(c) Includes:
- 15 privates 1st class
- 32 privates

Summary of Specialist Ratings:

4th Class	3
5th Class	7
6th Class	11
Total	21

(d) 1 for Officers Mess.

Table 746 W.—BATTALION COMBAT TRAIN, 8-INCH, 9.2-INCH OR 240-mm. HOWITZERS (MOTORIZED).

(War Strength.)

May 23, 1921.

Road Space....... ———Yards

Tonnage....... ———Tons

1	1	2	3	4	5	6	7	8	9	10	11	12
					1st Platoon			2nd Platoon				
1	UNITS	Specialist Rating (Class)	Symbol Number	Train Headquarters	1st Section	2nd Section	3rd Section	4th Section	5th Section	6th Section	Maintenance Section	Total
2	Captains			1								1
3	First lieutenants				1							1
4	Second lieutenants							1				1
5	Total Commissioned			1	1			1				3
6	First sergeants			1								1
7	Staff sergeants, incl.										1	1
8	Motor										(1)	
9	Sergeants, incl.			1	1	1	1	1	1	1	2	9
10	Agent			(1)								
11	Chiefs of Section				(1)	(1)	(1)	(1)	(1)	(1)		
12	Mess										(1)	
13	Supply										(1)	
14	Corporals, incl.			1	1	1	1	1	1	1		7
15	Ammunition				(1)	(1)	(1)	(1)	(1)	(1)		
16	Clerk			(1)								
17	Privates, 1st class and privates, incl.			4	17	16	16	17	16	16	22	124(a)
18	Chauffeurs	5th			(3)	(3)	(3)	(3)	(3)	(3)	(1)	
19	Chauffeurs.	6th		(1)	(3)	(3)	(3)	(3)	(3)	(3)	(2)	
20	Cooks (Assistant)	5th									(1)	
21	Cooks (First)	4th									(2)	
22	Drivers, tractor	5th									(1)	
23	Mechanics, chief	4th									(1)	
24	Mechanics, motor	5th									(2)	
25	Mechanics	6th									(1)	
26	Motorcyclists	6th		(1)	(1)			(1)			(3)	
27	Miscellaneous (not rated)			(2)	(10)	(10)	(10)	(10)	(10)	(10)	(9)	
28	Total Enlisted			7	19	18	18	19	18	18	26	143
29	Aggregate			8	20	18	18	20	18	18	26	146
30	Cars, motor, 5 passenger			1								1
31	Motorcycles, with side cars			1	1			1			2	5
32	Tractors, 2-1/2 or 5 ton										1	1
33	Trailers, kitchen										1	1
34	Trailers, water, (180 gal.)										1	1
35	Trucks, cargo, (F.W.D.)				6	6	6	6	6	6	2	38
36	Trucks, light repair										1	1
37	Pistols			8	20	18	18	20	18	18	25	145
38	Rifles, automatic				2			2			3	6

13 — Remarks

(a) Includes:
39 privates 1st class
85 privates

Summary of Specialist Ratings:
4th Class --- 3
5th Class --- 23
6th Class --- 27
Total 53

57088—21

746 W

Table 148 W.—BATTERY, 6-INCH GUNS, 155-mm. GUNS, OR 8-INCH HOWITZERS (MOTORIZED).

(War Strength.)

April 26, 1921.

Road Space...... ——Yards

Tonnage .... ——Tons

	1	2	3	4	5	6	7	8	9	10	11	12
					Firing Battery							
					1st Platoon		2nd Platoon		3rd Platoon			
	UNITS	Specialist Rating (class)	Symbol Number	Battery Headquarters and Detail	1st Section	2nd Section	3rd Section	4th Section	5th Section	Maintenance Section	Total	Remarks
2	Captains			1							1	
3	First lieutenants				1						1	
4	Second lieutenants						1		1		2	
5	Total Commissioned			1	1		1		1		4	
6	First sergeants			1							1	
7	Staff sergeants, incl.			1							1	
8	Motor			(1)								
9	Sergeants, incl.			3	1	1	1	1	1	2	10	
10	Chiefs of Section				(1)	(1)	(1)	(1)	(1)	(1)		
11	Observers			(1)								
12	Mess			(1)								
13	Communication			(1)								
14	Supply									(1)		
15	Corporals, incl.			7	2	2	2	2	2	1	18	
16	Agent			(1)								
17	Clerk			(1)								
18	Gunner				(2)	(2)	(2)	(2)	(2)			
19	Observer			(1)								
20	Scout			(2)								
21	Communication			(2)								
22	Miscellaneous									(1)		
23	Privates, 1st class and privates, incl.			23	18	17	18	17	18	22	133 (a)	(a) Includes: 43 privates, 1st class 90 privates
24	Chauffeurs	5th		(2)						(4)		
25	Chauffeurs	6th		(3)						(6)		
26	Cooks (Assistant)	5th		(2)								
27	Cooks (First)	4th		(2)								
28	Drivers, tractor	4th			(1)	(1)	(1)	(1)		(1)		Summary of Specialist Ratings: 4th Class --- 8 5th Class --- 12 6th Class --- 16 Total 36
29	Drivers, tractor	5th		(1)					(1)			
30	Mechanics, chief	4th		(1)								
31	Mechanics, motor	5th								(2)		
32	Mechanics	6th								(1)		
33	Motorcyclists	6th		(3)	(1)		(1)		(1)			
34	Miscellaneous (not rated)			(9)	(16)	(16)	(16)	(16)	(16)	(8)		
35	Total Enlisted			35	21	20	21	20	21	25	163	(b) 1 wire and reels 7 rations, baggage and personnel.
36	Aggregate			36	22	20	22	20	22	25	167	
37	Cars, motor, 5 passenger			1							1	
38	Motorcycles, with side cars			3	1		1		1		6	
39	Tractors, 2-1/2 or 5 ton			1					1		2	
40	Tractors, 10 ton				1	1	1	1		1	5	
41	Trailers, anti-aircraft, machine gun								1		1	
42	Trailers, kitchen			1							1	
43	Trailers, water, (180 gal.)			1							1	
44	Trucks, (F.W.D.), artillery supply			3							3	
45	Trucks, cargo, 3/4 ton			1							1	
46	Trucks, cargo, (F.W.D.)									8	8 (b)	
47	Trucks, light repair									1	1	
48	Trucks, tank, (750 gal.)									1	1	
49	Guns or howitzers				1	1	1	1			4	
50	Guns, machine, anti-aircraft								2		2	
51	Pistols			36	22	20	22	20	22	25	167	
52	Rifles, automatic			2	1	1	1	1	1	1	8	

Table 742 W.—BATTALION 8-INCH HOWITZERS, MOTORIZED (Consolidated Table).

(War Strength.)

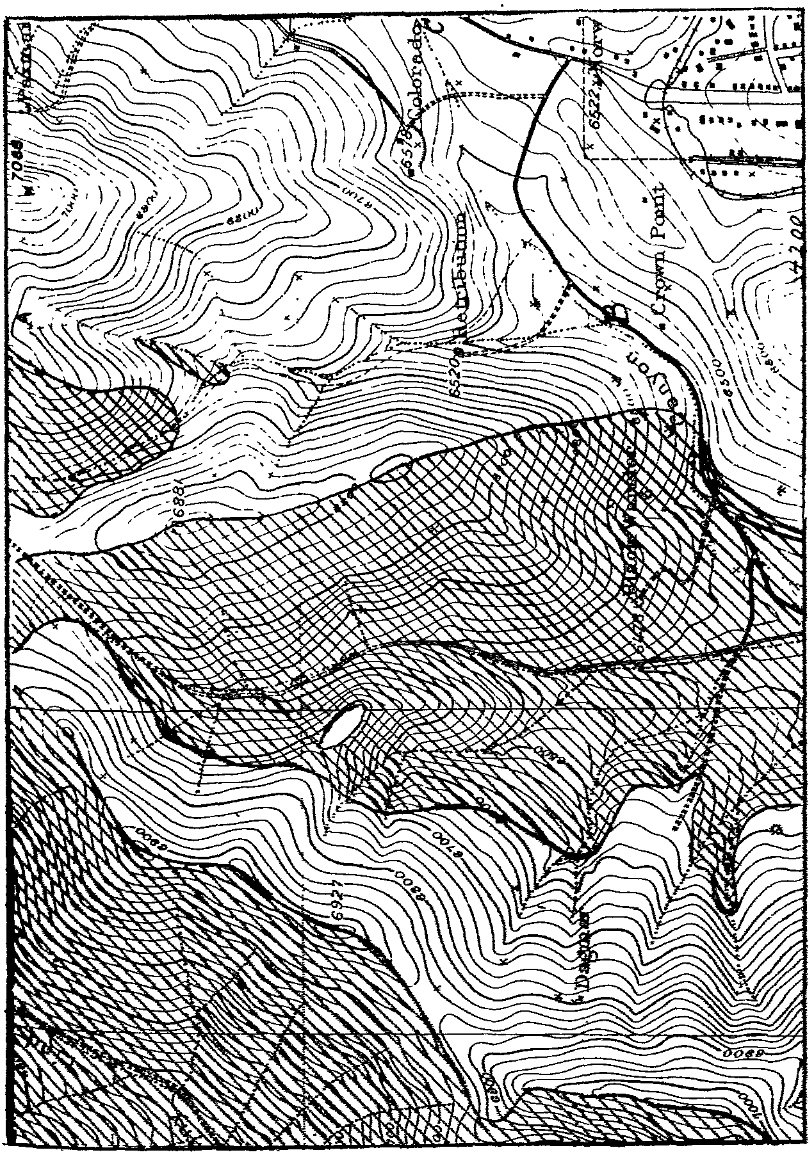
May 23, 1921.

Road Space.... ——Yards
Tonnage ...... ——Tons

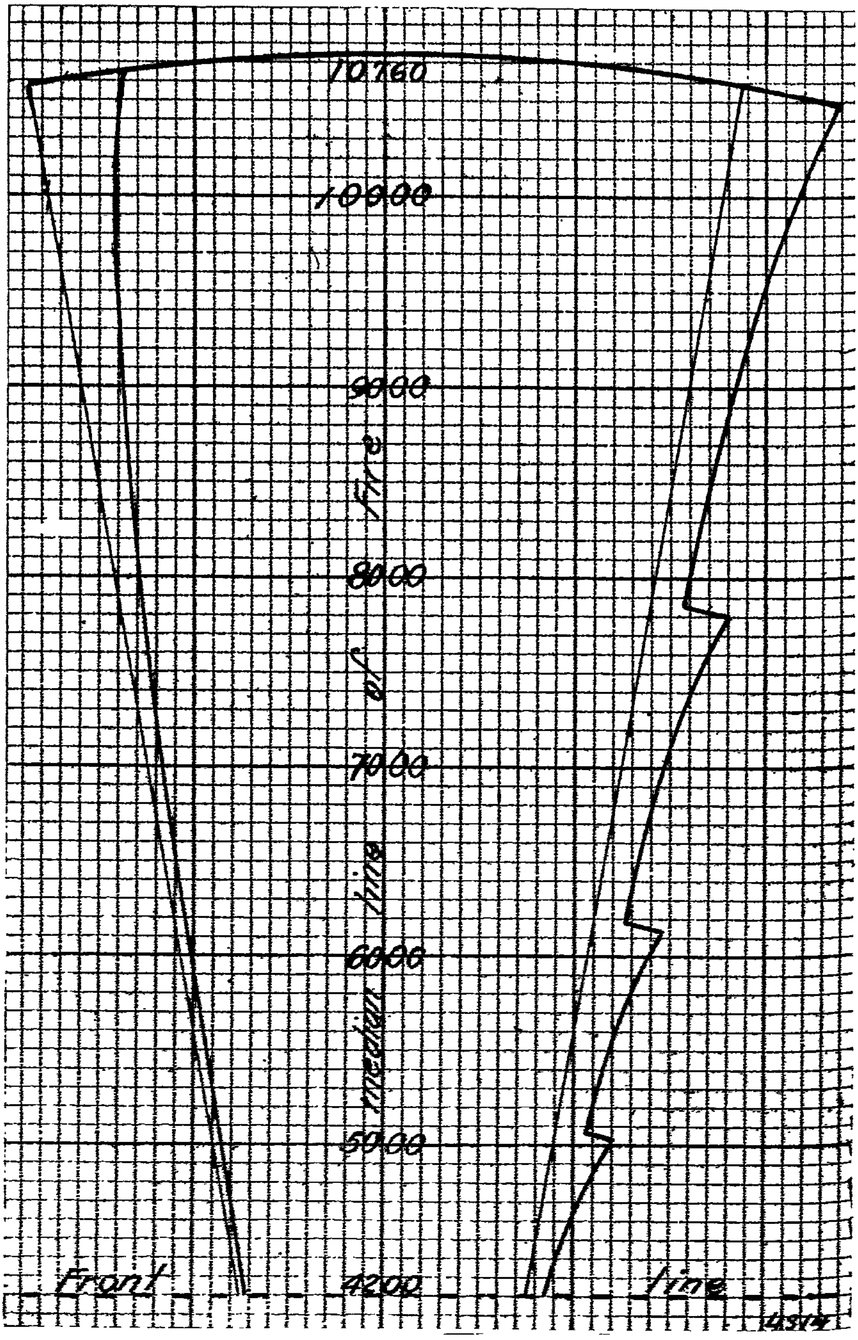
1	UNITS	Special-ist Rating (Class)	Symbol Number	Head-quarters and Head-quarters Detach-ment (a)	Com-bat Train (Table 746 W)	Two Bat-teries (Table 148 W)	Total	Remarks
	1	2	3	4	5	6	7	8
2	Majors			1			1	(a) Table 147 W
3	Captains			1	1	2	4	
4	First lieutenants			4	1	2	7	(b) 2 Load A and 4 Load B.
5	Second lieutenants			2	1	4	7	
6	Total Commissioned			8	3	8	19	
7	First sergeants			1	1	2	4	
8	Staff sergeants			2	1	2	5	
9	Sergeants			5	9	20	34	
10	Corporals			11	7	36	54	
11	Privates 1st class } incl.			15	39	86	140	
12	Privates } incl.			32	85	180	297	
13	Miscellaneous	4th		(3)	(3)	(16)	(22)	
14	Miscellaneous	5th		(7)	(23)	(24)	(54)	
[illegible]	Miscellaneous	6th		(11)	(27)	(32)	(70)	
15	Total Enlisted			66	142	326	534	
16	Aggregate			74	145	334	553	
17	Cars, motor, 5 passenger			2	1	2	5	
18	Cars, reconnaissance			1			1	
19	Motorcycles, with side cars			5	6	12	23	
20	Tractors, 2-1/2 or 5 ton			1	1	4	6	
21	Tractors, 10 ton					10	10	
22	Trailers, anti-aircraft, machine gun					2	2	
23	Trailers, kitchen			1	1	2	4	
24	Trailers, radio, 1-1/2 ton			1			1	
25	Trailers, water, (180 gal.)			1	1	2	4	
26	Trucks, (F.W.D.) artillery supply					(b) 6	6	
27	Trucks, cargo, 3/4 ton			1		2	3	
28	Trucks, cargo, (F.W.D.)			4	38	16	58	
29	Trucks, light repair				1	2	3	
30	Trucks, tank, (750 gal.)					2	2	
31	Howitzers					8	8	
32	Guns, machine, anti-aircraft					4	4	
33	Pistols			74	145	334	553	
34	Rifles, automatic			2	6	16	24	

[illegible]

Solution—Problem No. 9—Orientation



Solution—Problem No. 10—Orientation



THE BULLETIN BOARD

Captain Guy B. G. Hanna

SENIOR INSTRUCTOR, C. A. C.
STATE HOUSE, PROV., R. I.

Providence, June 5, 1922.

The Editor,
Journal of the U. S. Artillery,
Fort Monroe, Va.

My dear Sir:—

The other day in reading par. III, of G. O. 13, W. D., dated March 27, 1922, I noted that a seacoast battery on the Fort Mills, P. I., Military Reservation had been named in honor of the late Captain Guy B. G. Hanna, C. A. C., who was killed at service target practice, at Fort Moultrie, S. C., May 23, 1913, by the blowing out of a breechbolck on a R. F. Gun. As I recall it this accident was the occasion of the order to pass the hand over the face of the block, to make sure that the firing pin is not stuck and protruding.

The reading of this order reminded me of an incident in connection with his death, which should be of interest to every coast artillery officer, as an outstanding example of devotion to duty. It was related to me by my company quartermaster sergeant, Sergeant Thomas, a soldier of the old school, when I commanded the 78th Co., C. A. C., at Fort Moultrie.

It had been my almost invariable custom personally to keep my company fund account, that is to do the actual bookkeeping myself. My experience with the average sergeant has not increased my faith and trust in human nature, and my temporizing with subalterns had not augmented it.

Sergeant Thomas had always kept the fund book of the 78th Company, and paid the bills in town. One day I started to take the said book to my quarters, and I noticed that Sergeant Thomas was a bit hurt about it. He told me that after Captain Hanna was injured, he was taken to the hospital, and everything done that could be to ease his suffering. After reassuring his wife, he quietly sent for Sergeant Thomas and told him to bring the fund book with him. This he then had balanced to date, at the hospital, and signed. He thanked Sergeant Thomas and told him that now he felt better and could go with a clean conscience. He "went west" that night. It is needless to say that, in spite of my previous custom, Sergeant Thomas always was allowed to handle that fund thereafter.

This is as near as I can recall the story, but the lesson for all of us is right there. No matter how much ability an officer has, without some of Captain Hanna's spirit, he falls short of what he might be. Anyone who has commanded posts

and regiments, and has finally managed to gather in the fund books, appreciates to what I refer. I recall one book that reposed in storage in Paris, while the custodian fought his battery from Gerardmer to Sommedieue. However we managed to get it and its custodian via La Valdahon in time, even if we had to stall an inspector a bit, by amusing him with other irregularities.

I never met Captain Hanna, but I used to think, as I played the organ in the little Episcopal Church at Moultrie, where Colonel Guignard's brother was rector, that a bronze tablet to Captain Hanna might be appropriately placed on the walls.

The little incident, which I have endeavored to recount always impressed me deeply. Captain Hanna was not to see the World War, but an officer of such spirit could not have failed to have made his mark, had he been spared for greater things. As I look back upon it, I cannot but feel that his last act of duty displayed a bit of the same "divine fire" that made Lord French's "contemptible little army" clean their rifles and shave their chins, as they made their immortal retreat from Mons, with the old "spit and polish" spirit of the barrackroom at Aldershot. It also brings back to me the vision I saw in the sickbay of the "Northland," and the heroism of an unknown British stoker, who had been wounded by H. E. and machine gun fire, and gassed at the front, but who helped to stoke the steamer that took us thru the submarine zone, until a coal bucket in the head put an end to the bit he did for the cause of the Allies. Just a bit of the same indomitable spirit, which the Boche did not give us credit for possessing, and which underestimation of the situation was finally to cost them the war.

Very sincerely,

(Sgd.) G. A. Taylor,
Major, C. A. C., U. S. A.

BOOK REVIEWS

The Quartermaster Corps In The Year 1917 In The World War. By Henry G. Sharpe, Major General, U. S. Army. (Formerly Quartermaster General). New York. The Century Company. 1921. 5½" x 8". 424 pp. $3.00

The reader of this book is brought to visualize the performances of the Quartermaster Corps, upon the entrance of the United States into the World War in 1917, as having two major phases. First, that devolving upon the Quartermaster General's Office of determining the quantity of the many articles of Supply that would have to be secured for a large Army, the sources from which they could be secured and the distrubution to be made of them; and of providing transportation for supplies and for the mobilization of the Nation's man power and their subsequent transfer over great distances of land and water to their ultimate destination overseas. This phase also includes the readjustment and expansion of the Quartermaster Corps organization and personnel sufficiently to meet the emergency, and the issuance to the field of orders and instructions for the execution of the Quartermaster Corps responsibilities. This embraces the subject of Supply in its broad or primary sense as distinct from the second phase which may be described as the performance of the field forces in executing the details of Supply and Transportation in accordance with the Quartermaster General's instructions. Of the millions that comprised the armed forces of the United States and of greater milions in the business world, there were many whose contact with the Quartermaster Corps

afforded them more or less knowledge of and insight into this secondary phase of the Corps' functions and methods. The plans and preparations pertaining to the first phase, necessarily confidential and secret, being based upon the policy of the War Department for mobilization and disposition of the armed forces, were known only to those of high position and were only recorded in conferences held behind closed doors and in highly confidential correspondence. General Sharpe's book, therefore, while touching on the Corps activities in general, is highly interesting in that the greater portion of the volume dwells upon the broad problems which faced the Quartermaster General himself and of his plans and preparations to meet these problems,—enacted it might be said behind the scenes in the Quartermaster General's Office,—with interesting disclosures of conferences held by and memoranda passing between those high in authority, revealing their attitude in matters of momentous importance.

This book covers the Quartermaster Corps Activities during that most interesting period of our participation in the war, beginning several months previous to the entrance of the United States into the War and ending about December, 1917, including those anxious days when it was felt that America must engage in the War, followed by a period after April 6th, before definite or permanent policies for mobilizing and disposing of our armed forces were made known. General Sharpe's book recounts the conditions that existed in those strained months and how they affected the problems of Supply.

This book is interesting as a narrative having as its theme the stupendous task of the Quartermaster Corps during the early days of the War, the difficulties in the path of the prosecution of that task and how these difficulties were overcome; and is valuable in military libraries as having the nature of a study of the problem of supplying and transporting great numbers of our armed forces in time of war, prepared by one whose actual experience of the burden of such a heavy responsibility has enabled him to present the subject from a most broad and comprehensive point of view.

Pulling Together. By John T. Broderick. Robson and Adee. Schenectady, N. Y. 1922. 5¼" x 7½". 141 pp. Cloth.

A discussion of a plan of employee representation in the industrial world, this book purports to be the report by the author of a dialogue between an elderly corporation president and a philosophical commercial traveller in the smoking compartment of a parlor car between New York and Albany.

The author has thought to sugar-coat his pill of economic and social philosophy by smearing it with incidental persiflage, but the result is not so happy as he must have hoped. His discussion of the problems entering into the improvement of industrial relations by the introduction of employee representation is sound, well hinged together, and indicates that the author knows what he is talking about. It did not need to be bolstered up by the interlarding of hypothetical dialogue and the incidents of a railroad journey. The reader who is interested in this important subject could spare the frills, while very few who are not naturally interested to begin with, will be trapped into reading this book.

Continuous Wave Wireless Telegraphy. By B. E. G. Mittell. New York. Isaac Pitman Sons. 4" x 6½". 114 pp. 60 il. Price $0.85.

The author has very well stated in his preface that the aim of the book is to give the reader full value for his outlay. It is believed that he has done considerably more than that by directing the reader's attention to the very marked advantages of continuous wave telegraphy over spark telegraphy especially from the standpoint of long distance transmission and reception through interference.

This little book is a non-mathematical discussion of the principal methods. and applications in use at the present time. The subject matter is taken up under the following headings: 1. Radiating system. 2. The Poulsen Arc. 3. High frequency alternators. 4. Vacuum tubes. 5. Receiving aerials and interference. 6. Receiving apparatus.

By reason of limitations placed upon the volume only the essential features are taken up but the presentation is clear cut and leaves the reader more than satisfied with the material he obtains from his investment.

L'Artillerie dans l'Offensive. Thoughts and Memories By Colonel J. Roger. Paris, France. Berger-Levrault. 6½" x 10". 499 pp. 17 il. 4 maps. Price, 20 fr.

The work is controversial in character and deals from the point of view of stabilized warfare with the tactical employment of corps and divisional artillery. The author has had wide experience and has made excellent and interesting use of his material. The historical incidents are well chosen and make good reading for any one interested in military matters. The author attacks many of the chosen and approved doctrines of the artillery both in his own service and in our own! The arguments are logical and well drawn.

The author attacks the use of the following fires:

1. All destruction fires except for purpose of cutting wire.
2. All interdiction fires.
3. All harassing fires.
4. All rolling Barrages.
5. All prolonged Artillery preparations.

In short, all fires intended to obtain material results.

He advocates strongly:

1. A short violent artillery preparation.
2. Neutralization of hostile artillery by use of gas.
3. Destruction of front line wire by trench artillery.
4. Destruction of rear line wire by Field Artillery.
5. Temporary neutralization of hostile infantry and machine guns by violent concentration of artillery on known positions.

In short, those fires intended to alter the morale of the enemy.

He sums up the basis of his argument as follows:

1. Concentration of efforts both in time and space.
2. Surprise.
3. The predominance of the moral efforts over the material.

The work is upon the whole of more interest to the Field Artillery than to the Coast. We predict however that this work will cause quite a sensation in Field Artillery circles if it is translated, and it is well worth the translating.

The American Expeditionary Forces in Europe. 1917-1918. By Major Herman von Giehrl, Berlin, 1922. Published by E. S. Mittler and Sons. Berlin. From Allgemeine Schweizerische Militar Zeitung, 18th March, 1922. Translated by Col. George Ruhlen, U. S. A., Retired.

The author discusses in a practical and dispassionate manner, the participation of the American army in the European field of war operations, on the basis of information available from general literature and reports of the German General Staff. He gives a brief statement of the situation at the end of 1917, and admits that the wounds inflicted upon the German forces at Verdun and on the Somme were never healed. He treats very briefly of the provocation for the outbreak with America—the submarine warfare. His judgement of the American peace

army is temperate; an underestimation, as has been frequently asserted, was not justified, and it appears that the experiences of the civil war of secession were utilized. One did not, however, anticipate as rapid a transport service as actually took place. In the May and June conflicts in 1918 the American troops first took active part on the fighting lines and finally attacked independently and on their own initiative, at the bend of St. Mihiel. Their coming gave a heavy preponderence to the scale in their favor not only on account of the numerical superiority in the mass but also·by reason of their unexhausted nerve. They took their part with unhesitating recklessness and with heavy losses. In July America had already over 1,000,000 soldiers on the continent and 600,000 on the St. Mihile front. By their arrival every anticipation was exceeded and the overwhelming preponderance of the entente definitely established and their enemy crushed by physical force.

This work, which had already made its appearance in "Wissen und Wehr" is well worth reading.

The Battle of April 19, 1775, in Lexington, Concord, Lincoln, Arlington, Cambridge, Somerville and Charlestown, Mass. By F. W. Coburn. Lexington, Mass. Lexington Historical Society. 5¼" x 8". 189 pp. 42 il. 7 maps. Price $7.00.

Mr. Coburn has written a very complete and exhaustive account of the events immediately preceding this memorable day and has carried his narrative through to the return of the British troops to Charlestown on the evening of the nineteenth. The movements of the British troops from Boston and their return are dealt with in great detail as are the gathering of the Minute Men and their continuous attack from early morning till the last British soldier was in Charlestown Common.

Rosters of companies of the American patriots engaged in this struggle have been carefully checked over and are included in this small volume. Reports of American losses are quite complete. Numerous maps and photographs well illustrate the text and enliven the narrative. This is a well prepared volume and will strongly appeal to him who has a deep interest in the events surrounding the achievement of American independence from the British throne.

America Faces the Future. By Durant Drake, Ph. D. The Macmillan Co. New York. 1922. 5" x 7-5/8". 339 pp. Cloth. Price, $2.50.

Written in a spirit both critical and complacent, this book constitutes a survey and summary of the practical conditions in American life affecting the interpretation and future prospects of our national ideals of Liberty, Equality, Democracy, Efficiency and Patriotism.

While the volume includes in brief sketch an accurate presentation of the outstanding facts in our social, economic and governmental relations, in the words of the author—"It has been written not as a description of what we are but as a reminder of what we ought to be." In a truly philosophical style, facts showing the evils and excellencies of the important features of American life are marshaled and appraised in opposition and comparison. The net result is to leave the careful reader with an appreciation of the truly serious situation in which America faces the future, but at the same time with a more hopeful view of our possibilities than is generally to be obtained from recent writers in the fields of government, industry, education, and eugenics.

The book is outstanding through the author's reiterated insistence on the necessity for the free play in discussion of every sort of idea—the most radical as the most conservative, and in his frequent deduction that the facts of life justify confidence in the essential competence of the common people of America.

New Viewpoints in American History. By Arthur Meier Schlesinger, Professor of History in the University of Iowa. The Macmillan Co. New York. 1922. 5¼" and 7¾". 299 pp. Cloth. Price, $2.40.

Strictly speaking, the viewpoints presented in this work are not new, but are merely expected to be new to the general reader. Historians and students of history have long been accustomed to the interpretation of American history in terms of a consecutive process of causes and effects. However, as the author states, "Unfortunately, the product of the new school of American historians has, in very large part, been buried in the files of historical society journals, in the learned publications of the universities and in monographs privately printed at the expense of the authors."

The present work seeks to summarize some of the methods of approach to the interpretation of the consecutive data of our history in such fashion as to afford history teachers and students a new point of departure for their own exposition and research.

The author selects twelve of the major influences which may be traced consecutively through several periods in American history, and devotes to each one a chapter, in which he examines its development and its possible future effect on American life. Particularly significant are the chapters on Immigration, Geography, Economic Influences, Aristocracy, the Role of Women, State Rights, and the Parties.

As a natural result of the author's effort to maintain the truly impartial attitude of the historian, an effort, by the way, difficult to accomplish along with the positive function of interpretation, the informed and particularly the biased reader will here and there clash with Professor Schlesinger's opinions, especially in the later chapters, where the historical material lies within the field of the reader's direct observation.

Special Details of Field Artillery. By Major Ralph Hospital, F.A. Menasha, Wis. George Banta Publishing Company. 5¼" x 7½". 112 pp. 36 il. 1 map. Price $0.75.

Though this book was prepared for use as a text for Field Artillery units of the R. O. T. C., much of its contents will be found of use to the Coast Artillery officer with one of our heavy regiments. This will particularly be the case for those detailed with the National Guard or Organized Reserves. The book covers not only the detailed duties of Battery, Battalion, Regimental and Brigade details but after completing their explanation furnishes solutions of type problems. Appendices cover the selection of positions, communications and telephones, fire control matériel, and finally gives a table of special equipment for these details. The book is well arranged in a handy, pocket size and should prove of great assistance in the training of details.

A Manual of International Law for the Use of Naval Officers. Second Revised Edition. By C. H. Stockton, LL.D., Rear Admiral, U. S. N., Retired. U. S. Naval Institute, Annapolis, Md., 1921. 5¼" x 7¾". 355 pp. Price $4.00.

As indicated by its title this book is intended primarily as a manual for the use of officers of the United States Navy. For this reason it deals largely with the maritime aspects of international law, while covering only briefly and generally the other phases of the subject. Army officers and students generally will therefore find it of value chiefly as a supplementary reference book for use in connection with the study of other texts on international law.

The first edition of this work was published in 1910. This second revised edition contains a supplementary chapter dealing mainly with certain maritime questions raised during the World War. Some comments prompted by German violations of international law and the severity of her administration of military government in occupied enemy territory during the war have also been added in other parts of the book. No attempt, however, has been made in the revision to set forth any changes in the rules and usages of international law which may have resulted from the World War with its introduction of new forces and weapons. In fact it is pointed out that the time for a settlement or even a calm and deliberate discussion of these questions is not yet ripe.

Our 110 Days' Fighting. By Arthur W. Page. New York. Doubleday, Page & Company. 6″ x 9¼″. 283 pp. 25 maps. Price $5.00.

In this volume one will find a concise account of the operations of the American Army in the face of the enemy during the World War. After briefly delineating the entire efforts of our Army, the author limits his subject to the period during which our troops were occupying active sectors of the front. His calculations reduce this to "110 Days." The narrative consists of a sketch of the active operations carried out in each sector during this period and is followed by a brief historical sketch of each division engaged.

The work is well arranged attractively made up and is well supplied with maps of the regions affected. An accompanying pocket contains operations maps of the St. Mihiel and Meuse-Argonne offensives on which are marked the positions and advances of each division. Though the accounts are but brief, this book is a handy work for quick reference and will prove not only interesting but valuable as well.

International Relations. By James Bryce. The Macmillan Co. New York. 1922. 5¼″ x 7¾″. 275 pp. Cloth. Price, $2.50.

In this, the last work of Lord Bryce completed before his death, are gathered the eight lectures which he delivered before the Institute of Politics at Williams College in Massachusetts during August, 1921.

The lectures consider in order—*The Earlier Relations of Tribes and States to One Another, The Great War and Its Effects in the Old World, Non-Political Influences Affecting International Relations, The Causes of War, Diplomacy and International Law, Popular Control of Foreign Policy and the Morality of States, Methods Proposed for Settling International Controversies* and *Other Possible Methods for Averting War.* This mere enumeration may mean but little to one unacquainted with the writing of Lord Bryce, but any reader of "The American Commonwealth" or "Modern Democracies" will be able to imagine the wealth of illuminating inquiry and exposition with which this bare skeleton of an outline is clothed by the hand of Lord Bryce.

Of particular interest to the reviewer was the search for a more pronounced expression of conviction concerning the probable outcome of Democracy than was obtainable from Lord Bryce's last previous book—"Modern Democracies." There are frequent passages in "International Relations," particularly in the lecture on *Popular Control of Foreign Policy,* which are illuminating, yet nowhere is there positive indication that Lord Bryce had found cause in the last year of his life for complete confidence in the ultimate success of the practice of Democracy. However he does insist that the only foundation for permanent peace in the world is the constraining and enlightened force of public opinion among the citizens of the leading states of the world. In this, as in other matters, there is to be found a substantial agreement by Lord Bryce and the recent writing of Walter Lippman in his "Public Opinion."

Radio Handbook. (Lefax) By J. H. Dellinger and L. E. Whittemore. Philadelphia. Lefax, Inc. 1922. 4½″×7″. 99 pp. Profusely illustrated with diagrams and photographs. Price $3.50. Leather.

This latest loose-leaf handbook in a limp leather cover is well up to Lefax standard. The authors are chief and alternate chief, respectively, in the Radio Laboratory of the United States Bureau of Standards in Washington. Knowing that and the character of some of their other works, you can readily judge the merit and accuracy of their latest work.

A glance at chapter heads shows "What Radio Does," "How to Receive," "Antennas," "Fundamental Principles," "Receiving and Transmitting," "Lines of Advance" and lastly "Apparatus" which latter consists of trade photographs, descriptions and prices. An appendix covers "Tentative Underwriter's Regulations," a list of broadcasting stations with schedules and, finally, some blank sheets for the reader's notes and sketches. Though briefly presented, the theory and description of apparatus and of hook-ups are clear and sufficient. The diagrams are plain and simple. The authors have arranged a very good, readable and practical volume while the publishers have put it in an attractive and convenient form.

A special feature of the book is that by the return of an enclosed postal, Lefax will keep the purchaser supplied with further improvements in the form of additional sheets until July 1, 1923.

The American Party System. By Charles Edward Merriam. Professor of Political Science in the University of Chicago. The Macmillan Company. New York. 1922. 5¼″ x 7¾″. 439 pp. Cloth. Price $9.00.

In the prefatory words of the author, "This volume is an analysis of the American party system, an account of the structure, processes and significance of the political party, designed to show as clearly as possible within compact limits what the function of the political party is in the community." In the accomplishment of the monumental task so succinctly set forth, Professor Merriam has brought forth an examination of the American party system at once exhaustive orderly, and concise. Very properly he traces the development of party organization and leadership, with its comitant development of the boss, the spoils system, nominating and election systems, party discipline, and custodianship of traditions and policies by parties, before he proceeds to interpretation and prognostication concerning the theories, functions and future of parties.

At every step, observation and statement are backed up by citation to historical incident, statistical data or quotations from statemen and students. As a result there has been evolved a book which should be considered as both a convenient and necessary collateral reference to the interpretive study of American history, government and sociology.

A History of the United States Since the Civil War, Volume II. By Ellis Paxson Oberholtzer. The Macmillan Co. New York. 1922. 6″ x 9″. 649 pp. Cloth. Price $4.00.

Of this monumental work, Volume II, covering the period from 1868 to 1872, has appeared.

In this volume Dr. Oberholtzer describes the dramatic impeachment and trial of Andrew Johnson, and advances his narrative through the first Grant administration. The extravagance and corruption of public and private life after the Civil War are vividly detailed through a period which affords abundant analogy for the study of present day problems. The progress of Reconstruction in the South and the development of the Ku Klux Klan are graphically described. The per-

spective of history is thrown upon Grant and the men who surrounded him and used his name and reputation to further their various ends.

In a chapter upon the great dispute between the United States and England, over the depredations of the *Alabama*, and its settlement, the author has turned to many new and important sources. The completion of the Pacific Railroad, the Credit Mobilier scandal, and the downfall of the Tweed Ring are topics included in the volume.

From the Somme to the Rhine. By S. Ashmead-Bartlett. London, England. John Lane, The Bodley Head, Ltd. 5¼" x 7¾". 206 pp. 4 maps. Price 7/6.

This work purports to be the diary of a regimental staff officer of the British Army covering the period from 9 August 18 to 12 January 19.

The author, to judge from the internal evidence, seems to have been a literary man rather than a soldier for the events of which he treats are always approached from the popular angle. He deals with what he saw, smelt, heard and thought but gives no picture of the military events either large or small.

The writing is well done and the interest well sustained throughout tho marred from the American standpoint by the constant use of British military abbreviations which are not too familiar even to the professional soldier.

Upon the whole the work has no military value and from a literary standpoint is so affected by the conscious striving for literary effects as to seem to be a product of the "Salon de Rambouillet" rather than a soldier's journal of the present age. Despite these defects the work has some merit and may well serve to pass pleasantly an idle hour or twain.

The Key of Libberty. By William Manning, written in 1798. Published by the Manning Association, Billercia, Mass. 1922. 6¼" x 9½". 71 pp. Paper boards. Price $3.00.

This ancient document, preserved among the archives of the Manning family in Massachusetts, has been brought to light and published, with a foreword and annotations by Samuel Eliot Morison, lecturer on History, in Harvard University. It forms a remarkable commentary on the political thought prevailing during the period subsequent to the Revolution, and immediately following the adoption of the Federal Constitution.

Concerning the author one may best quote his own words, "I am not a Man of Larning my selfe for I neaver had the advantage of six months schooling in my life. I am no travelor for I neaver was 50 Miles from whare I was born in no direction, & I am no grate reader of antiant history for I always followed hard labour for a living. But I always thought it My duty to search into & see for my selfe in all maters that consansed me as a member of society."

He was an independent and iconoclastic thinker, imbued with an attitude of suspicion toward all men not hand-laborers, which causes him to inveigh grimly against "the Society of Cincinaty, Speculators, Stock & Land Jobbers, Doctors, Marchants, Literary Men & Coledges, Ministers of the Gospel, Juditial & Executive Officers, and Lawyers," and in particular against "The Name of Woshingtone," or "Warshington."

His general thesis in all this and other "Causes that Ruen Republicks" is that Selfishness is the dominating quality in all human activity, and, (presaging Karl Marx) the that "Few" have let accident and opportunity fortify their selfishness in depriving the "Many" from the successful exploitation of their own selfishness.

William Manning was also ahead of his time in his enunciation of economic policy, as for instance—"For Labour is the soul parrant of all property ***," and in his proposed "Remidy" antedates the doctrines of trade unionism by his

definite outline for the organization of all farmers and laborers in a "Labouring Society."

As an original source document this little book should be read by the analytical student of early American history.

We are informed that the Manning Manse, built in 1696, in which William Manning was born, lived, and died, still stands at North Billercia, Massachusetts.

The Modern Idea of the State. By H. Krabbe, Professor of Public Law in the University of Leyden, Holland. Translated by George H. Sabine and Walter J. Shepard. D. Appleton & Co. New York, 1922. Printed in Holland. 6" x 9". 363 pp. Cloth.

Originally written in Dutch, this book was translated into German, from which edition the present authorized English translation was evidently made by Professors Sabine and Shepard.

Stripped to the barest skeleton, the theory so illuminatingly developed by Professor Krabbe may be stated as the negation of the concept of *sovereignty* as the authority and basis for the organization of the State; the author contending that now and always the real authority of the State has rested on Law, and that this Law, whether decreed, statutory or customary, has maintained its sanction as an integrating force through its approximation to an expression of the *Sense of Right* inherent in the individual and collective consciousness of men. Stated so bluntly and concisely, the idea seems open to the most far-reaching attack and criticism. But Professor Krabbe has gone to great length to clothe this stark skeleton with vivifying exposition which goes for to carry conviction and overcome every point of criticism.

His argument postulates that the basis and purpose of every community is to serve a necessary social end, and that to attain this end there must be a *unity of the legal rule.* To accomplish and maintain this unity of legal rule, there must be an approximately common and homogeneous conviction of *what is right.* From this the author proceeds to several interesting conclusions. Among these is the deduction that the conviction or decision of the *majority* is necessary, not merely as a practical expedient, but as a logical corallary of human relations. Another is the explanation of the often observed fact that statutes are nullified in effect long before they are repealed, because the very act of committing an existing expression of "what is right" to statute thereby renders the expression static and stationary, whereas the actual "sense of right" is dynamic, always changing. Again is the lucid recognition of the increasing dominance of merely intellectual force by *emotion.*

The author frankly recognizes not only the difference in the organization of States, but the reason for it which lies in the difference in the communal "sense of right" among varying peoples. Nevertheless in the latter part of his book he presages the gradual preparation for an accomplishment of a world state. In this particular, the author is more sanguine than the reviewer. For reasons convincingly set forth by Lord Bryce in his last book, "International Relations," (See pages 239-245) it seems necessary to doubt Professor Krabbe's optimism in this regard, even after making all due allowances for the difference in outlook of Professor Krabbe and Lord Bryce concerning the traditional aspect of *sovereignty.*

Finally it should be remarked that the American translators have prepared an Introduction of nearly eighty pages, which in the opinion of the reviewer, while valuable and illuminating, might better serve as an Appendix than as an Introduction. At any rate the reviewer makes bold to suggest that the reader not already familiar with the general point of view of Professor Krabbe, read his book before attacking the Introduction.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